

# Compilation of Wind Tunnel Coefficients for Parabolic Reflectors

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National Aeronautics and  
Space Administration

Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California





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SUBJECT: Errata

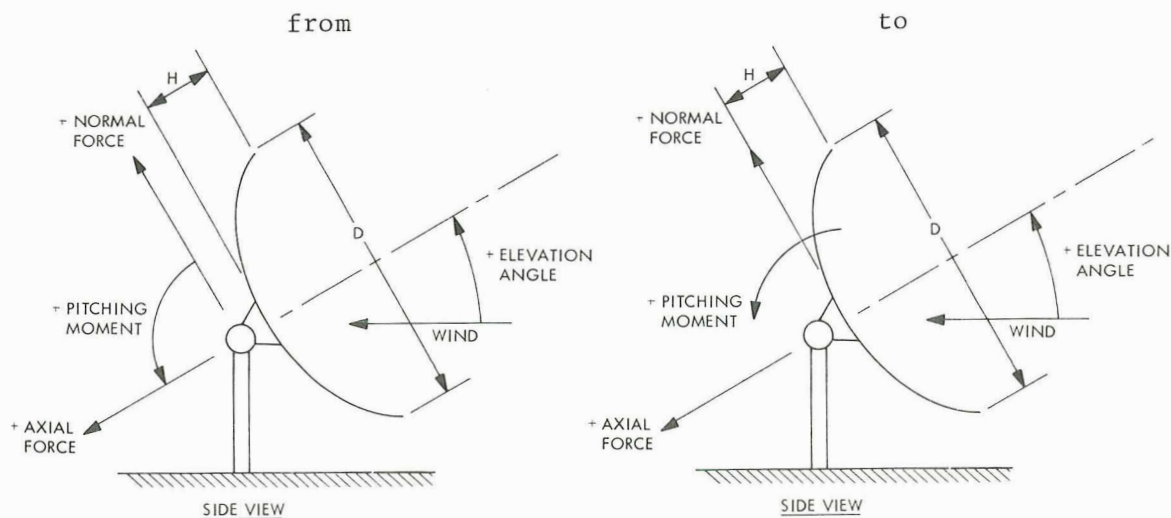
Please note the following corrections to JPL Publication 78-16, Compilation of Wind Tunnel Coefficients for Parabolic Reflectors, by R. Levy and D. Kurtz, dated April 15, 1978.

Page v, the title for Table A-2: change  $F/D = 0.424$ ,  $H/D = 0.147$  to  $F/D = 0.313$ ,  $H/D = 0.200$ .

Page 1, column 1, the text table: add a column as shown:

| Appendix A<br>Table | Combination | F/D   | H/D   | P   |
|---------------------|-------------|-------|-------|-----|
| A-2                 | 1           | 0.313 | 0.200 | 0%  |
| A-3                 | 2           | 0.313 | 0.200 | 25% |
| A-4                 | 3           | 0.313 | 0.200 | 50% |
| A-1                 | 4           | 0.424 | 0.147 | 50% |

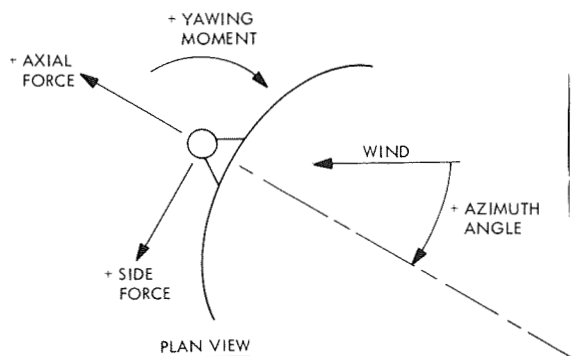
Page 5, Fig. 23: change the Side View



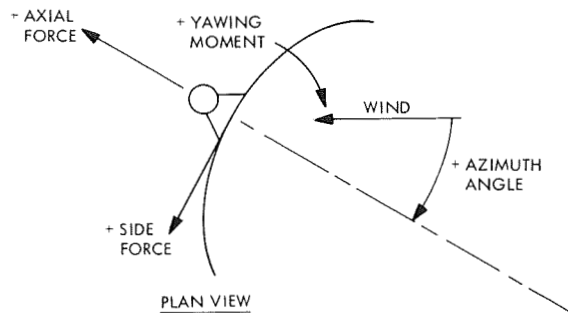


Change the Plan View

from



to



Page 27, the title for Table A-2: change  $F/D = 0.424$ ,  $H/D = 0.147$  to  $F/D = 0.313$ ,  $H/D = 0.200$ .

Very truly yours,

John Kempton, Manager  
Documentation Section

JPL PUBLICATION 78-16

# Compilation of Wind Tunnel Coefficients for Parabolic Reflectors

R. Levy  
D. Kurtz

April 15, 1978

National Aeronautics and  
Space Administration

**Jet Propulsion Laboratory**  
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National Aeronautics and Space Administration

## Preface

Since the publication of "Compilation of Wind Tunnel Coefficients for Parabolic Reflectors" in *The Deep Space Network*, Space Programs Summary 37-63, Vol. II, pp. 36-41, May 31, 1970 there have been several requests internally and from industry for the complete sets of wind tunnel data that were assembled. To facilitate anticipated requests and future transmission, an appendix containing computer printouts for all of the four data sets are reproduced here. Since interpretation of these data is meaningless without an exact definition of the coordinate system frame of reference, the original article is reproduced as well.

During a recent application of the data in the 26-m S-X Mods program forces and torques computed using the data were compared with alternative results using data applied by the Rohr Corporation for design of the Mars antenna. W. S. Katow and W. Ng made the comparisons and concluded that the data presented here does not exhibit several evident anomalies found in results from the information used by Rohr. Nevertheless, several obvious spikes from key punch errors were discovered and have been removed by smoothing.

In the application of these coefficients it should be clearly understood that they represent a composite of wind tunnel tests on several different models, most heavily weighted by data derived for Mars antenna design studies. Applying the data to other antennas would introduce mild-to-strong errors, depending upon different influences of associated structures, such as pedestals, alidades, feed or subreflector supports. Differences in the local terrain and nature of the boundary layer plane introduce additional discrepancies. Although the foregoing reservations have also been covered in the original paper, it seems to be worth while to emphasize that application of the data may be valid only in a preliminary sense.

The work described in this report was performed by the Applied Mechanics Division of the Jet Propulsion Laboratory.



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## **Abstract**

Wind tunnel data to predict loading on antenna structures is tabulated.

## Compilation of Wind Tunnel Coefficients for Parabolic Reflectors

### Compilation of Wind Tunnel Coefficients for Parabolic Reflectors, R. Levy and D. Kurtz

**a. Introduction.** Complete sets of aerodynamic wind loading coefficients have been assembled from existing wind tunnel tests for parabolic reflectors. The coefficients have been compiled for four particular combinations of focal length  $F$ , diameter  $D$ , reflector depth  $H$ , and surface porosity  $P$ . These combinations, which are representative of typical JPL antennas in the 85- and 210-ft-diam class, are:

| Combination | $F/D$ | $H/D$ | $P$ |
|-------------|-------|-------|-----|
| 1           | 0.313 | 0.200 | 0%  |
| 2           | 0.313 | 0.200 | 25% |
| 3           | 0.313 | 0.200 | 50% |
| 4           | 0.424 | 0.147 | 50% |

As the four configurations are similar to surfaces previously studied in extensive wind tunnel programs,<sup>4</sup> it

was reasonable to use interpolation methods to generate the present data. Very little smoothing was performed since the identification of "bad points" is questionable. Whenever large gaps appeared, the existing data were hand-plotted and faired. As the result, the six conventional aerodynamic coefficients were determined by a combination of hand and computer interpolation.

**b. Data compilation.** The conventional force (axial, normal, side) and moment (pitch, yaw, roll) coefficients are non-dimensionalized and tabulated for 5-deg increments of antenna elevation and azimuth orientations relative to the wind direction. The compilations are available either in 80-column punched card format or as the output of a computer program that reads the cards, prints the coefficients in tabular form, and provides SC-4020 plots of coefficient curves. Figure 21 shows an example program print-out; Fig. 22 shows plots for the head-on wind case (0-deg azimuth) for each of the four reflector combinations.

**c. Nomenclature.** The position of the dish relative to the wind is defined by the azimuth and elevation angles (Fig. 23). The azimuth angle is the angle between the wind and the centerline of the paraboloidal reflector projected on the ground plane. The elevation angle is the angle between the reflector centerline and the ground

<sup>4</sup>Fox, N. L., and Dayman, B., Jr., *Preliminary Report on Paraboloidal Reflector Antenna Wind Tunnel Tests*, Feb. 28, 1962 (JPL internal document); and Blaylock, R. B., *Aerodynamic Coefficients for a Model of a Paraboloidal-Reflector Directional Antenna Proposed for a JPL Advanced Antenna System*, May 1, 1964 (JPL internal document).

| PARABOLIC ANTENNA WIND COEFFICIENTS  |                 |                |        |                 |        |        |                |                 |                |        |                 | DATE 041370 | PAGE 9 |
|--|-----------------|----------------|--------|-----------------|--------|--------|----------------|-----------------|----------------|--------|-----------------|-------------|--------|
| -WIND LOAD COEFFICIENTS FOR PARABOLOID- F/D=0.424, r/D=0.147, POROSITY=50 PCI. |                 |                |        |                 |        |        |                |                 |                |        |                 |             |        |
| *****AZIMUTH ANGLE = 0.0****   |                 |                |        |                 |        |        |                |                 |                |        |                 |             |        |
| ELEV.<br>ANGLE   | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE   | MOMENT<br>PITCH | ROLL   | YAW    | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE   | MOMENT<br>PITCH | ROLL        | YAW    |
| 0  | 0.001           | 0.841          | -0.002 | 0.013           | -0.001 | -0.001 | 90.0           | 0.197           | -0.050         | -0.002 | 0.064           | -0.002      | -0.001 |
| 5.0  | 0.005           | 0.871          | -0.002 | 0.024           | -0.003 | -0.001 | 95.0           | 0.191           | -0.100         | -0.002 | 0.066           | -0.002      | -0.001 |
| 10.0   | 0.017           | 0.831          | -0.002 | 0.028           | -0.002 | -0.001 | 100.0          | 0.186           | -0.193         | -0.002 | 0.063           | -0.002      | -0.002 |
| 15.0   | 0.032           | 0.827          | -0.002 | 0.030           | -0.001 | -0.001 | 105.0          | 0.184           | -0.193         | -0.002 | 0.067           | -0.001      | -0.002 |
| 20.0   | 0.051           | 0.813          | -0.001 | 0.032           | -0.002 | -0.001 | 110.0          | 0.187           | -0.235         | -0.002 | 0.063           | -0.003      | -0.001 |
| 25.0   | 0.071           | 0.798          | -0.001 | 0.032           | -0.001 | -0.002 | 115.0          | 0.197           | -0.272         | -0.002 | 0.070           | -0.001      | 0.000  |
| 30.0   | 0.094           | 0.752          | -0.000 | 0.031           | -0.002 | -0.002 | 120.0          | 0.207           | -0.320         | -0.001 | 0.071           | -0.002      | 0.002  |
| 35.0   | 0.117           | 0.703          | -0.001 | 0.030           | -0.001 | -0.001 | 125.0          | 0.214           | -0.372         | -0.001 | 0.071           | -0.001      | 0.002  |
| 40.0   | 0.142           | 0.651          | -0.002 | 0.025           | -0.001 | -0.001 | 130.0          | 0.217           | -0.438         | -0.000 | 0.070           | -0.002      | 0.001  |
| 45.0   | 0.165           | 0.591          | -0.003 | 0.024           | -0.001 | 0.000  | 135.0          | 0.217           | -0.508         | -0.000 | 0.063           | -0.003      | 0.000  |
| 50.0   | 0.186           | 0.551          | -0.003 | 0.028           | -0.002 | 0.000  | 140.0          | 0.202           | -0.575         | -0.000 | 0.053           | -0.002      | -0.001 |
| 55.0   | 0.206           | 0.515          | -0.002 | 0.036           | -0.003 | 0.000  | 145.0          | 0.192           | -0.648         | -0.001 | 0.040           | -0.001      | 0.000  |
| 60.0   | 0.228           | 0.475          | -0.002 | 0.045           | -0.002 | 0.000  | 150.0          | 0.174           | -0.700         | -0.001 | 0.013           | -0.001      | 0.001  |
| 65.0   | 0.234           | 0.418          | -0.001 | 0.052           | -0.001 | 0.000  | 155.0          | 0.155           | -0.742         | -0.001 | 0.001           | -0.002      | 0.002  |
| 70.0   | 0.223           | 0.313          | -0.001 | 0.058           | -0.000 | 0.000  | 160.0          | 0.124           | -0.785         | -0.001 | -0.011          | -0.000      | 0.002  |
| 75.0   | 0.200           | 0.200          | -0.002 | 0.063           | -0.000 | 0.000  | 165.0          | 0.102           | -0.822         | -0.001 | -0.023          | -0.000      | 0.002  |
| 80.0   | 0.211           | 0.055          | -0.002 | 0.064           | -0.002 | 0.000  | 170.0          | 0.071           | -0.845         | -0.001 | -0.031          | -0.003      | 0.002  |
| 85.0   | 0.203           | 0.042          | -0.003 | 0.065           | -0.001 | 0.000  | 175.0          | 0.036           | -0.850         | -0.001 | -0.038          | -0.001      | 0.002  |
| 90.0   | 0.197           | -0.050         | -0.002 | 0.062           | -0.002 | -0.001 | 180.0          | 0.000           | -0.862         | -0.001 | -0.041          | -0.001      | 0.001  |
| *****AZIMUTH ANGLE = 5.0****   |                 |                |        |                 |        |        |                |                 |                |        |                 |             |        |
| ELEV.<br>ANGLE   | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE   | MOMENT<br>PITCH | ROLL   | YAW    | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE   | MOMENT<br>PITCH | ROLL        | YAW    |
| 0  | 0.000           | 0.630          | 0.002  | 0.024           | 0.000  | 0.000  | 90.0           | 0.204           | -0.056         | 0.013  | 0.064           | -0.002      | 0.010  |
| 5.0  | 0.006           | 0.821          | 0.002  | 0.027           | -0.002 | 0.000  | 95.0           | 0.201           | -0.093         | 0.013  | 0.067           | -0.001      | 0.010  |
| 10.0   | 0.020           | 0.821          | 0.004  | 0.026           | -0.002 | 0.000  | 100.0          | 0.198           | -0.144         | 0.013  | 0.066           | -0.001      | 0.010  |
| 15.0   | 0.036           | 0.813          | 0.007  | 0.028           | -0.000 | 0.000  | 105.0          | 0.196           | -0.182         | 0.013  | 0.067           | -0.001      | 0.010  |
| 20.0   | 0.054           | 0.805          | 0.011  | 0.029           | -0.001 | -0.001 | 110.0          | 0.196           | -0.223         | 0.013  | 0.068           | -0.002      | 0.010  |
| 25.0   | 0.075           | 0.784          | 0.015  | 0.028           | -0.001 | -0.002 | 115.0          | 0.201           | -0.258         | 0.013  | 0.067           | -0.000      | 0.011  |
| 30.0   | 0.093           | 0.754          | 0.020  | 0.028           | -0.001 | -0.002 | 120.0          | 0.203           | -0.300         | 0.013  | 0.067           | -0.001      | 0.012  |
| 35.0   | 0.123           | 0.713          | 0.023  | 0.027           | 0.000  | -0.001 | 125.0          | 0.203           | -0.346         | 0.013  | 0.065           | -0.001      | 0.012  |
| 40.0   | 0.145           | 0.665          | 0.024  | 0.025           | -0.001 | 0.000  | 130.0          | 0.205           | -0.408         | 0.013  | 0.064           | -0.002      | 0.012  |
| 45.0   | 0.173           | 0.611          | 0.025  | 0.026           | -0.000 | 0.001  | 135.0          | 0.195           | -0.465         | 0.020  | 0.057           | -0.002      | 0.011  |
| 50.0   | 0.193           | 0.567          | 0.024  | 0.030           | -0.001 | 0.004  | 140.0          | 0.183           | -0.525         | 0.020  | 0.046           | -0.002      | 0.010  |
| 55.0   | 0.211           | 0.528          | 0.023  | 0.032           | -0.001 | 0.006  | 145.0          | 0.172           | -0.583         | 0.013  | 0.037           | -0.001      | 0.011  |
| 60.0   | 0.228           | 0.485          | 0.023  | 0.046           | -0.001 | 0.010  | 150.0          | 0.156           | -0.637         | 0.013  | 0.021           | -0.001      | 0.012  |
| 65.0   | 0.232           | 0.420          | 0.022  | 0.053           | 0.000  | 0.003  | 155.0          | 0.140           | -0.674         | 0.013  | 0.007           | -0.002      | 0.012  |
| 70.0   | 0.226           | 0.323          | 0.021  | 0.055           | -0.001 | 0.003  | 160.0          | 0.115           | -0.715         | 0.013  | -0.002          | -0.001      | 0.012  |
| 75.0   | 0.219           | 0.220          | 0.020  | 0.063           | -0.000 | 0.011  | 165.0          | 0.093           | -0.746         | 0.020  | -0.012          | -0.001      | 0.012  |
| 80.0   | 0.212           | 0.121          | 0.019  | 0.065           | -0.001 | 0.011  | 170.0          | 0.064           | -0.766         | 0.020  | -0.015          | -0.003      | 0.012  |
| 85.0   | 0.207           | 0.048          | 0.019  | 0.066           | -0.001 | 0.010  | 175.0          | 0.027           | -0.774         | 0.021  | -0.026          | -0.000      | 0.012  |
| 90.0   | 0.204           | -0.056         | 0.019  | 0.064           | -0.002 | 0.010  | 180.0          | 0.000           | -0.781         | 0.020  | -0.030          | -0.000      | 0.011  |

Fig. 21. Computer tabulation example

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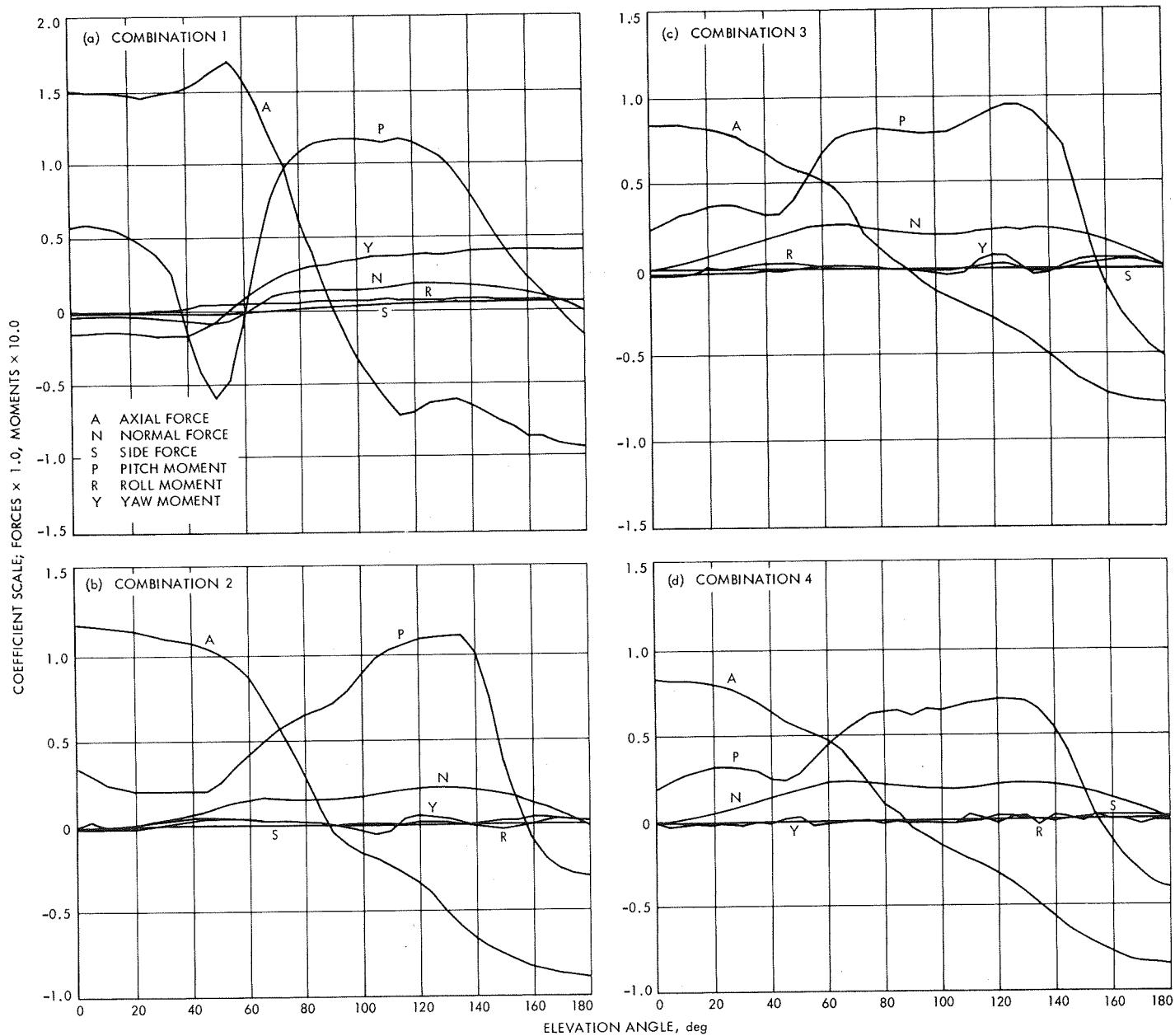


Fig. 22. Coefficient curves for 0-deg azimuth

plane. When both the azimuth and elevation angles are zero, the concave side of the reflector is directed symmetrically upwind. When the elevation angle is 90 deg, the antenna is pointed at the zenith.

The *body axis system* is a system that always moves with the dish. Its axes define the directions of the axial,

normal, and side force vectors. The origin is positioned at the reflector vertex and all moments are adjusted to apply at that point.

The forces and moments presented in Fig. 23 are in the form of the customary non-dimensional aerodynamic coefficients. The force coefficients are defined as

$$\frac{\text{force}}{(\text{dynamic pressure}) \times (\text{reflector frontal area})}$$

The moment coefficient is defined as

$$\frac{\text{moment}}{(\text{dynamic pressure}) \times (\text{reflector frontal area}) \times (\text{reflector diameter})}$$

The dynamic pressure is defined as

$$\frac{(\text{ambient static air density}) \times (\text{air velocity})^2}{2}$$

The force and moment sign conventions are as follows (Fig. 23):

- (1) **Axial force.** Along the centerline and positive towards the concave surface at the reflector.
- (2) **Normal force.** Perpendicular to the centerline and positive in a vertical direction upwards when both the azimuth and elevation angles are zero.
- (3) **Side force.** Perpendicular to the centerline and positive to the right (viewed from the convex side) when the azimuth angle is zero and elevation angle is less than 90 deg.
- (4) **Pitch moment.** Positive for a pitch-up moment when azimuth angle is zero.
- (5) **Yaw moment.** Positive for a clockwise moment (viewed from above).
- (6) **Roll moment.** Positive for a clockwise moment when viewed from the convex side of a reflector.

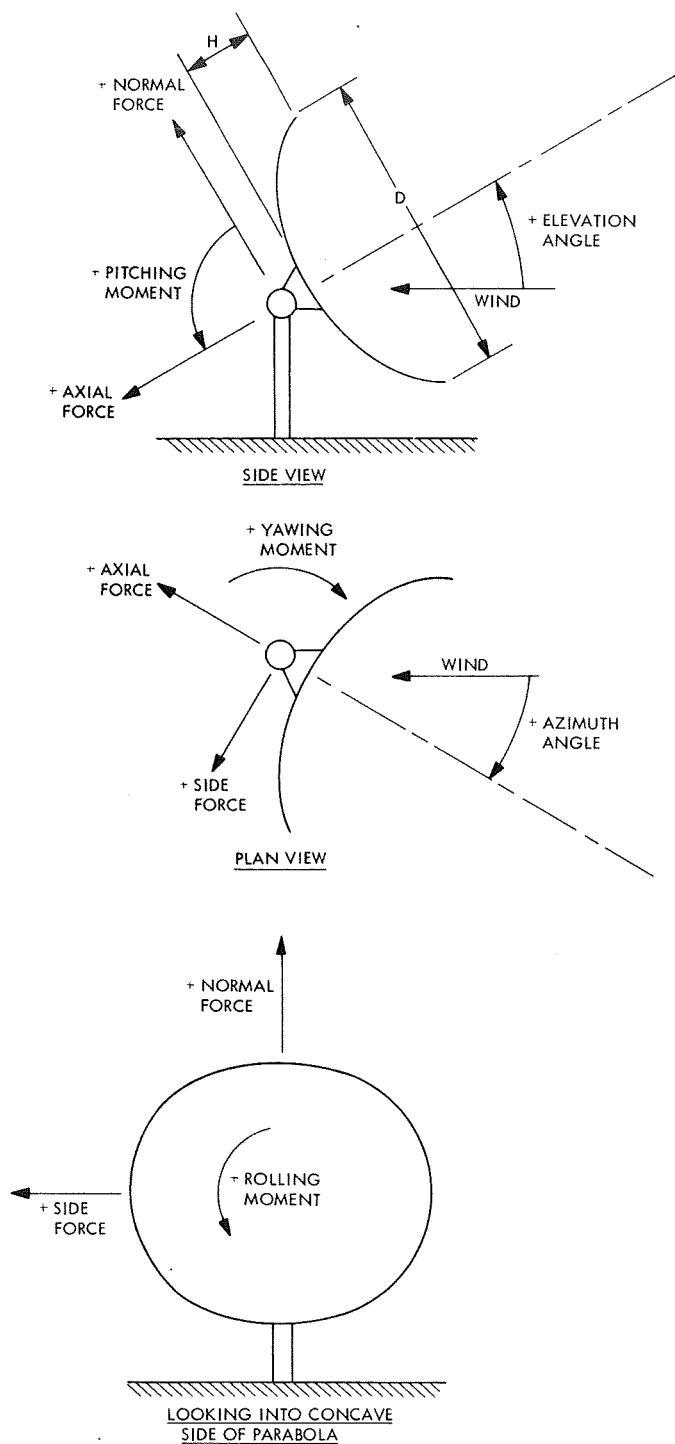
*d. Validity of coefficients.* All coefficients were derived from a series of wind tunnel tests and are, hence, subject to any and all features peculiar to each test. Due to the manner in which a balance was used for resolving the forces and moments, the pitch and roll moment data are substantially inferior to the other four components. If it were not for the support effect and other tunnel

boundary flow anomalies, the rolling moment coefficient should be identically zero. Reynold's Number effects were studied during the initial wind tunnel investigations and conditions were so arranged that no scaling corrections have to be made for application to a full-size antenna. The wind is always assumed to be parallel to the ground plane.

No attempt has been made to include effects due to supporting structure and ground plane; the coefficients are the result of wind loads on the parabolic surface only. Therefore, the present results are primarily useful for preliminary analysis in the absence of wind tunnel tests on a specific model that represents the applicable supporting and back-up structures. For practical applications, some estimate should be made of the auxiliary effects of the additional structure and ground plane interaction. To obtain an indication, a survey has been made to compare the present coefficients with those found for a wind tunnel model of a 210-ft-diam antenna, which also included support structures.<sup>5</sup> The following trends were observed:

- (1) **Normal force.** The magnitude of the coefficient is increased by about 5% (i.e., if the coefficient is

<sup>5</sup>Blaylock, R. B., *Aerodynamic Coefficients for a Model of a Paraboloidal-Reflector Directional Antenna Proposed for a JPL Advanced Antenna System*, May 1, 1964 (JPL internal document).



**Fig. 23. Nomenclature for force-moment tabular data and body axis orientation**

positive, it becomes 5% more positive; if it is negative, it becomes 5% more negative).

- (2) **Axial force.** Essentially no change.
- (3) **Side force.** The magnitude of the coefficient is increased by about 30%.
- (4) **Pitching moment.** The magnitude of the coefficient is reduced by about 25%.
- (5) **Yawing moment.** The magnitude of the coefficient is reduced by about 15%.
- (6) **Rolling moment.** The magnitude of the coefficient is reduced by about 100%.

**e. Comments on porosity.** Some analysis was performed concerning the characteristics of porous panels of varying hole diameters and hole length (skin thickness). In particular, the minimum hole-length-to-diameter ratio ( $l/d$ ) for which the benefits of porosity were still achieved was of interest. A reasonable argument exists that all flow that passes through a porous panel will, in fact, enter normal to that panel and, further, that the flow "inside" the panel will be laminar since wind velocities in question correspond to subcritical Reynold's Numbers. In order to define the condition at which the drag characteristics of a porous panel degrade significantly, one needs only to consider the mass flow rate through the panel. It may be shown (Ref. 1) that the drag variation with  $l/d$  increases asymptotically to approach the drag of a solid panel. That is, if the panel is "infinitely thin" it represents the best case (least drag), rated as 100% efficient; as  $l/d$  increases, the porous panel behaves more and more like a solid panel. In fact, as  $l/d$  approaches 3, almost no drag reduction is achieved for a porous panel and the efficiency approaches 0%. The 25 and 50% porosity combinations given in Figs. 21 and 22 had relatively small  $l/d$  and the efficiencies were close to 100%.

#### Reference

1. Schlichting, H., *Boundary Layer Theory*, McGraw-Hill Book Co., Inc., New York, 1960.

**Appendix A**  
**Wind Load Coefficients**

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Table A-1. Wind load coefficients for paraboloid,  $F/D = 0.424$ ,  $H/D = 0.147$ , porosity 50%

| ****AZIMUTH ANGLE = .0**** |                    |       |                     |       |                |                    |       |                     |       |                     |       |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|                            | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0                          | -.001              | .841  | -.002               | .019  | 90.0           | .197               | -.050 | -.002               | .062  | -.002               | -.001 |
| 5.0                        | .005               | .831  | -.002               | .024  | 95.0           | .191               | -.100 | -.002               | .066  | -.002               | -.001 |
| 10.0                       | .017               | .831  | -.002               | .028  | 100.0          | .186               | -.153 | -.002               | .065  | -.002               | -.002 |
| 15.0                       | .032               | .827  | -.002               | .030  | 105.0          | .184               | -.193 | -.002               | .067  | -.002               | -.002 |
| 20.0                       | .051               | .813  | -.001               | .032  | 110.0          | .187               | -.235 | -.002               | .069  | -.003               | -.001 |
| 25.0                       | .071               | .788  | -.001               | .032  | 115.0          | .197               | -.272 | -.002               | .070  | -.001               | -.000 |
| 30.0                       | .094               | .752  | -.000               | .031  | 120.0          | .207               | -.320 | -.001               | .071  | -.002               | -.002 |
| 35.0                       | .117               | .703  | -.001               | .030  | 125.0          | .214               | -.372 | -.001               | .071  | -.001               | -.002 |
| 40.0                       | .142               | .651  | -.002               | .025  | 130.0          | .217               | -.438 | -.000               | .070  | -.002               | -.001 |
| 45.0                       | .165               | .591  | -.003               | .024  | 135.0          | .217               | -.508 | -.000               | .065  | -.003               | -.000 |
| 50.0                       | .186               | .551  | -.003               | .028  | 140.0          | .208               | -.579 | -.000               | .055  | -.002               | -.001 |
| 55.0                       | .206               | .515  | -.002               | .030  | 145.0          | .192               | -.648 | -.001               | .040  | -.001               | -.000 |
| 60.0                       | .228               | .475  | -.002               | .045  | 150.0          | .174               | -.700 | -.001               | .019  | -.001               | -.001 |
| 65.0                       | .234               | .418  | -.001               | .052  | 155.0          | .155               | -.742 | -.001               | .001  | -.002               | -.002 |
| 70.0                       | .229               | .313  | -.001               | .058  | 160.0          | .124               | -.785 | -.001               | -.011 | -.000               | -.002 |
| 75.0                       | .220               | .200  | -.002               | .063  | 165.0          | .102               | -.822 | -.001               | -.023 | -.000               | -.002 |
| 80.0                       | .211               | .095  | -.002               | .064  | 170.0          | .071               | -.845 | -.001               | -.031 | -.003               | -.002 |
| 85.0                       | .203               | -.042 | -.003               | .065  | 175.0          | .036               | -.850 | -.001               | -.038 | -.001               | -.002 |
| 90.0                       | .197               | -.050 | -.002               | .062  | 180.0          | .000               | -.862 | -.001               | -.041 | -.001               | -.001 |

| ****AZIMUTH ANGLE = 5.0**** |                    |       |                     |       |                |                    |       |                     |       |                     |      |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| 0                           | .000               | .830  | .002                | .024  | 90.0           | .204               | -.056 | .019                | .064  | -.002               | .010 |
| 5.0                         | .006               | .821  | .002                | .027  | 95.0           | .201               | -.093 | .019                | .067  | -.001               | .010 |
| 10.0                        | .020               | .821  | .004                | .028  | 100.0          | .198               | -.144 | .019                | .066  | -.001               | .010 |
| 15.0                        | .036               | .819  | .007                | .028  | 105.0          | .196               | -.182 | .019                | .067  | -.001               | .010 |
| 20.0                        | .054               | .805  | .011                | .029  | 110.0          | .196               | -.223 | .019                | .068  | -.002               | .010 |
| 25.0                        | .075               | .784  | .015                | .028  | 115.0          | .201               | -.258 | .019                | .067  | -.000               | .011 |
| 30.0                        | .099               | .754  | .020                | .028  | 120.0          | .203               | -.300 | .019                | .067  | -.001               | .012 |
| 35.0                        | .123               | .713  | .023                | .027  | 125.0          | .203               | -.346 | .019                | .065  | -.001               | .012 |
| 40.0                        | .149               | .665  | .024                | .025  | 130.0          | .205               | -.408 | .020                | .062  | -.001               | .012 |
| 45.0                        | .173               | .611  | .025                | .026  | 135.0          | .195               | -.469 | .020                | .057  | -.002               | .011 |
| 50.0                        | .193               | .567  | .024                | .030  | 140.0          | .183               | -.529 | .020                | .048  | -.002               | .010 |
| 55.0                        | .211               | .528  | .023                | .038  | 145.0          | .172               | -.589 | .019                | .037  | -.001               | .011 |
| 60.0                        | .228               | .485  | .023                | .046  | 150.0          | .156               | -.637 | .019                | .021  | -.001               | .012 |
| 65.0                        | .232               | .420  | .022                | .053  | 155.0          | .140               | -.674 | .019                | .007  | -.002               | .012 |
| 70.0                        | .226               | .323  | .021                | .059  | 160.0          | .115               | -.715 | .019                | -.002 | -.001               | .012 |
| 75.0                        | .218               | .220  | .020                | .063  | 165.0          | .093               | -.746 | .020                | -.012 | -.001               | .012 |
| 80.0                        | .212               | .121  | .019                | .065  | 170.0          | .064               | -.766 | .020                | -.019 | -.003               | .012 |
| 85.0                        | .207               | -.048 | .019                | .066  | 175.0          | .027               | -.774 | .021                | -.026 | -.000               | .012 |
| 90.0                        | .204               | -.056 | .019                | .064  | 180.0          | .000               | -.781 | .020                | -.030 | -.000               | .011 |

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Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 10.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| 0              | .000               | .819  | .006                | .030  | 90.0           | .211               | -.063 | .040                | .066  | -.002               | .021 |
| 5.0            | .008               | .812  | .007                | .030  | 95.0           | .211               | -.086 | .040                | .068  | -.001               | .021 |
| 10.0           | .023               | .811  | .010                | .028  | 100.0          | .211               | -.136 | .040                | .068  | .000                | .022 |
| 15.0           | .040               | .811  | .017                | .027  | 105.0          | .209               | -.172 | .040                | .068  | -.001               | .022 |
| 20.0           | .058               | .797  | .023                | .026  | 110.0          | .206               | -.211 | .040                | .067  | .001                | .022 |
| 25.0           | .079               | .781  | .031                | .025  | 115.0          | .205               | -.244 | .040                | .065  | .000                | .022 |
| 30.0           | .105               | .756  | .041                | .025  | 120.0          | .199               | -.280 | .040                | .063  | .000                | .023 |
| 35.0           | .130               | .724  | .045                | .025  | 125.0          | .192               | -.320 | .039                | .059  | .001                | .023 |
| 40.0           | .156               | .679  | .046                | .025  | 130.0          | .194               | -.378 | .040                | .054  | .000                | .023 |
| 45.0           | .181               | .632  | .047                | .028  | 135.0          | .173               | -.430 | .040                | .049  | -.002               | .022 |
| 50.0           | .201               | .583  | .046                | .033  | 140.0          | .158               | -.480 | .040                | .042  | .002                | .022 |
| 55.0           | .229               | .542  | .045                | .040  | 145.0          | .152               | -.530 | .040                | .034  | .001                | .022 |
| 60.0           | .250               | .495  | .044                | .047  | 150.0          | .138               | -.574 | .040                | .023  | -.002               | .023 |
| 65.0           | .270               | .423  | .043                | .054  | 155.0          | .125               | -.607 | .040                | .014  | .002                | .022 |
| 70.0           | .284               | .333  | .043                | .060  | 160.0          | .106               | -.645 | .040                | .006  | -.002               | .022 |
| 75.0           | .217               | .241  | .042                | .064  | 165.0          | .084               | -.670 | .041                | -.001 | -.002               | .022 |
| 80.0           | .213               | .148  | .041                | .066  | 170.0          | .057               | -.688 | .041                | -.007 | -.004               | .022 |
| 85.0           | .211               | .054  | .041                | .067  | 175.0          | .018               | -.698 | .043                | -.015 | .000                | .022 |
| 90.0           | .211               | -.063 | .040                | .066  | 180.0          | -.001              | -.701 | .041                | -.020 | .001                | .021 |

\*\*\*AZIMUTH ANGLE = 15.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| 0              | .000               | .809  | .010                | .036  | 90.0           | .218               | -.070 | .062                | .069  | -.002               | .033 |
| 5.0            | .010               | .803  | .012                | .033  | 95.0           | .221               | -.079 | .062                | .070  | -.001               | .033 |
| 10.0           | .026               | .802  | .016                | .029  | 100.0          | .224               | -.128 | .061                | .070  | .001                | .034 |
| 15.0           | .044               | .803  | .027                | .026  | 105.0          | .222               | -.162 | .061                | .069  | -.001               | .034 |
| 20.0           | .062               | .789  | .035                | .024  | 110.0          | .216               | -.199 | .061                | .066  | .001                | .034 |
| 25.0           | .084               | .778  | .048                | .022  | 115.0          | .209               | -.230 | .061                | .063  | .000                | .034 |
| 30.0           | .111               | .758  | .062                | .022  | 120.0          | .196               | -.260 | .061                | .059  | .001                | .034 |
| 35.0           | .137               | .735  | .067                | .023  | 125.0          | .182               | -.295 | .060                | .054  | .002                | .034 |
| 40.0           | .164               | .693  | .068                | .026  | 130.0          | .183               | -.348 | .060                | .047  | .000                | .034 |
| 45.0           | .190               | .653  | .069                | .031  | 135.0          | .152               | -.391 | .060                | .041  | -.002               | .034 |
| 50.0           | .209               | .600  | .068                | .036  | 140.0          | .134               | -.431 | .060                | .036  | .002                | .034 |
| 55.0           | .222               | .556  | .067                | .042  | 145.0          | .132               | -.471 | .061                | .031  | .001                | .034 |
| 60.0           | .230               | .505  | .066                | .049  | 150.0          | .121               | -.512 | .061                | .025  | -.003               | .034 |
| 65.0           | .228               | .426  | .065                | .056  | 155.0          | .110               | -.540 | .061                | .021  | .002                | .033 |
| 70.0           | .222               | .344  | .065                | .061  | 160.0          | .097               | -.575 | .061                | .015  | -.003               | .033 |
| 75.0           | .216               | .262  | .064                | .065  | 165.0          | .076               | -.595 | .062                | .009  | -.004               | .033 |
| 80.0           | .215               | .175  | .063                | .067  | 170.0          | .050               | -.610 | .063                | .004  | -.005               | .033 |
| 85.0           | .215               | .061  | .063                | .069  | 175.0          | .010               | -.623 | .066                | -.004 | .000                | .032 |
| 90.0           | .218               | -.070 | .062                | .069  | 180.0          | -.002              | -.621 | .062                | -.010 | .002                | .032 |

Table A-1 cont'd

| ***AZIMUTH ANGLE = 20.0**** |                    |       |      |                     |      |      |                |      |      |                    |       |      |
|-----------------------------|--------------------|-------|------|---------------------|------|------|----------------|------|------|--------------------|-------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      | FLEV.<br>ANGLE |      |      | FORCE COEFFICIENTS |       |      |
|                             | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |                |      |      | NORMAL             | AXIAL | SIDE |
| 0                           | .001               | .792  | .040 | .033                | .001 | .001 | 90.0           | .202 | .046 | .074               | .056  | .029 |
| 5.0                         | .012               | .788  | .045 | .031                | .001 | .001 | 95.0           | .203 | .072 | .073               | .057  | .029 |
| 10.0                        | .028               | .785  | .050 | .025                | .001 | .000 | 100.0          | .203 | .118 | .072               | .057  | .030 |
| 15.0                        | .045               | .781  | .059 | .021                | .000 | .000 | 105.0          | .201 | .149 | .072               | .056  | .031 |
| 20.0                        | .064               | .766  | .066 | .019                | .000 | .000 | 110.0          | .198 | .183 | .073               | .053  | .032 |
| 25.0                        | .086               | .752  | .076 | .018                | .002 | .002 | 115.0          | .194 | .210 | .075               | .051  | .034 |
| 30.0                        | .111               | .731  | .087 | .018                | .000 | .002 | 120.0          | .186 | .233 | .079               | .048  | .035 |
| 35.0                        | .135               | .706  | .091 | .019                | .000 | .000 | 125.0          | .178 | .260 | .081               | .046  | .037 |
| 40.0                        | .159               | .666  | .092 | .021                | .001 | .000 | 130.0          | .179 | .298 | .085               | .042  | .039 |
| 45.0                        | .182               | .623  | .092 | .026                | .000 | .005 | 135.0          | .156 | .332 | .088               | .038  | .041 |
| 50.0                        | .201               | .572  | .092 | .030                | .001 | .012 | 140.0          | .142 | .362 | .091               | .034  | .043 |
| 55.0                        | .213               | .525  | .090 | .036                | .002 | .018 | 145.0          | .137 | .396 | .096               | .029  | .044 |
| 60.0                        | .221               | .472  | .089 | .042                | .000 | .027 | 150.0          | .127 | .432 | .099               | .023  | .044 |
| 65.0                        | .219               | .396  | .081 | .047                | .002 | .025 | 155.0          | .115 | .461 | .101               | .018  | .044 |
| 70.0                        | .213               | .316  | .084 | .050                | .002 | .026 | 160.0          | .100 | .500 | .103               | .013  | .044 |
| 75.0                        | .206               | .239  | .081 | .053                | .000 | .030 | 165.0          | .079 | .533 | .104               | .008  | .043 |
| 80.0                        | .204               | .156  | .079 | .054                | .001 | .028 | 170.0          | .054 | .563 | .106               | .004  | .043 |
| 85.0                        | .202               | .057  | .076 | .055                | .001 | .028 | 175.0          | .018 | .588 | .109               | .001  | .043 |
| 90.0                        | .202               | .046  | .074 | .056                | .001 | .029 | 180.0          | .000 | .594 | .104               | .005  | .043 |
| ***AZIMUTH ANGLE = 25.0**** |                    |       |      |                     |      |      |                |      |      |                    |       |      |
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      | ELEV.<br>ANGLE |      |      | FORCE COEFFICIENTS |       |      |
|                             | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |                |      |      | NORMAL             | AXIAL | SIDE |
| 0                           | .002               | .776  | .071 | .031                | .001 | .002 | 90.0           | .187 | .023 | .087               | .043  | .025 |
| 5.0                         | .014               | .773  | .078 | .029                | .000 | .002 | 95.0           | .185 | .065 | .085               | .044  | .025 |
| 10.0                        | .030               | .769  | .084 | .021                | .000 | .001 | 100.0          | .183 | .108 | .083               | .044  | .027 |
| 15.0                        | .047               | .759  | .091 | .017                | .000 | .001 | 105.0          | .181 | .137 | .083               | .044  | .028 |
| 20.0                        | .067               | .744  | .097 | .015                | .001 | .000 | 110.0          | .180 | .167 | .085               | .040  | .030 |
| 25.0                        | .088               | .726  | .105 | .014                | .002 | .001 | 115.0          | .179 | .190 | .089               | .039  | .034 |
| 30.0                        | .111               | .704  | .112 | .014                | .000 | .001 | 120.0          | .177 | .206 | .097               | .037  | .037 |
| 35.0                        | .133               | .677  | .115 | .015                | .000 | .001 | 125.0          | .174 | .225 | .103               | .038  | .040 |
| 40.0                        | .154               | .639  | .116 | .017                | .000 | .000 | 130.0          | .175 | .249 | .110               | .038  | .045 |
| 45.0                        | .175               | .594  | .116 | .021                | .000 | .005 | 135.0          | .161 | .273 | .116               | .036  | .049 |
| 50.0                        | .193               | .545  | .116 | .025                | .001 | .012 | 140.0          | .150 | .293 | .123               | .032  | .053 |
| 55.0                        | .205               | .494  | .114 | .031                | .002 | .017 | 145.0          | .143 | .322 | .131               | .027  | .055 |
| 60.0                        | .212               | .439  | .112 | .035                | .001 | .023 | 150.0          | .133 | .352 | .137               | .021  | .055 |
| 65.0                        | .210               | .367  | .097 | .039                | .002 | .023 | 155.0          | .120 | .383 | .141               | .016  | .055 |
| 70.0                        | .204               | .289  | .104 | .040                | .002 | .024 | 160.0          | .103 | .425 | .145               | .011  | .055 |
| 75.0                        | .197               | .217  | .099 | .041                | .001 | .026 | 165.0          | .082 | .471 | .147               | .007  | .054 |
| 80.0                        | .193               | .138  | .095 | .041                | .001 | .024 | 170.0          | .058 | .516 | .149               | .005  | .054 |
| 85.0                        | .190               | .053  | .089 | .042                | .000 | .024 | 175.0          | .026 | .553 | .152               | .002  | .054 |
| 90.0                        | .187               | .023  | .087 | .043                | .001 | .025 | 180.0          | .000 | .567 | .146               | .000  | .054 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 30.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | .004               | .760  | .102                | .003 | 90.0           | .172               | .000  | .030                | -.001 | .030                | -.001 |
| 5.0            | .016               | .758  | .111                | .003 | 95.0           | .167               | -.059 | .031                | -.002 | .031                | -.002 |
| 10.0           | .032               | .753  | .118                | .002 | 100.0          | .163               | -.098 | .032                | .004  | .032                | .004  |
| 15.0           | .049               | .738  | .124                | .002 | 105.0          | .161               | -.125 | .032                | .000  | .032                | .000  |
| 20.0           | .070               | .722  | .129                | .001 | 110.0          | .162               | -.152 | .027                | -.004 | .027                | -.004 |
| 25.0           | .091               | .700  | .134                | .000 | 115.0          | .165               | -.170 | .027                | -.002 | .027                | -.002 |
| 30.0           | .111               | .677  | .137                | .001 | 120.0          | .168               | -.180 | .027                | .000  | .027                | .000  |
| 35.0           | .131               | .648  | .139                | .001 | 125.0          | .172               | -.190 | .031                | .002  | .031                | .002  |
| 40.0           | .150               | .612  | .140                | .001 | 130.0          | .170               | -.200 | .034                | -.003 | .034                | -.003 |
| 45.0           | .168               | .565  | .140                | .002 | 135.0          | .166               | -.214 | .034                | .000  | .034                | .000  |
| 50.0           | .186               | .518  | .140                | .002 | 140.0          | .158               | -.225 | .031                | -.001 | .031                | -.001 |
| 55.0           | .197               | .464  | .138                | .003 | 145.0          | .149               | -.248 | .025                | -.001 | .025                | -.001 |
| 60.0           | .203               | .407  | .136                | .002 | 150.0          | .139               | -.273 | .019                | .001  | .019                | .001  |
| 65.0           | .202               | .338  | .113                | .002 | 155.0          | .126               | -.305 | .014                | -.001 | .014                | -.001 |
| 70.0           | .195               | .262  | .124                | .002 | 160.0          | .107               | -.351 | .010                | .001  | .010                | .001  |
| 75.0           | .188               | .195  | .117                | .002 | 165.0          | .086               | -.410 | .007                | .001  | .007                | .001  |
| 80.0           | .183               | .120  | .111                | .020 | 170.0          | .062               | -.469 | .006                | .001  | .006                | .001  |
| 85.0           | .178               | .050  | .103                | .001 | 175.0          | .035               | -.519 | .005                | .000  | .005                | .000  |
| 90.0           | .172               | .000  | .100                | .001 | 180.0          | .002               | -.540 | .004                | -.001 | .004                | -.001 |

\*\*\*AZIMUTH ANGLE = 35.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | .005               | .735  | .128                | .011 | 90.0           | .161               | -.010 | .029                | .000  | .029                | .000  |
| 5.0            | .016               | .730  | .137                | .011 | 95.0           | .156               | -.069 | .029                | -.001 | .029                | -.001 |
| 10.0           | .030               | .724  | .144                | .010 | 100.0          | .153               | -.110 | .030                | .002  | .030                | .002  |
| 15.0           | .047               | .710  | .150                | .010 | 105.0          | .151               | -.126 | .030                | .000  | .030                | .000  |
| 20.0           | .066               | .697  | .154                | .003 | 110.0          | .152               | -.154 | .027                | -.002 | .027                | -.002 |
| 25.0           | .087               | .675  | .157                | .001 | 115.0          | .154               | -.173 | .028                | -.002 | .028                | -.002 |
| 30.0           | .106               | .653  | .159                | .001 | 120.0          | .155               | -.185 | .029                | .000  | .029                | .000  |
| 35.0           | .125               | .626  | .160                | .008 | 125.0          | .155               | -.196 | .033                | .000  | .033                | .000  |
| 40.0           | .142               | .594  | .160                | .011 | 130.0          | .155               | -.207 | .035                | -.002 | .035                | -.002 |
| 45.0           | .159               | .557  | .158                | .015 | 135.0          | .148               | -.223 | .036                | .000  | .036                | .000  |
| 50.0           | .174               | .515  | .157                | .021 | 140.0          | .140               | -.237 | .032                | .000  | .032                | .000  |
| 55.0           | .183               | .467  | .153                | .026 | 145.0          | .120               | -.278 | .027                | .000  | .027                | .000  |
| 60.0           | .188               | .413  | .150                | .029 | 150.0          | .091               | -.303 | .019                | .000  | .019                | .000  |
| 65.0           | .188               | .345  | .132                | .032 | 155.0          | .073               | -.387 | .016                | .000  | .016                | .000  |
| 70.0           | .182               | .269  | .137                | .033 | 160.0          | .051               | -.423 | .012                | .000  | .012                | .000  |
| 75.0           | .176               | .200  | .131                | .032 | 165.0          | .033               | -.458 | .008                | .001  | .008                | .001  |
| 80.0           | .171               | .125  | .125                | .032 | 170.0          | .033               | -.486 | .006                | .000  | .006                | .000  |
| 85.0           | .166               | .054  | .119                | .032 | 175.0          | .001               | -.508 | .005                | -.001 | .005                | -.001 |
| 90.0           | .161               | -.010 | .116                | .033 | 180.0          | .001               | -.508 | .005                | -.001 | .005                | -.001 |

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Table A-1 cont'd

| ***AZIMUTH ANGLE = 40.0*** |                    |       |                     |       |                |        |                    |       |                     |       |                     |      |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------|--------------------|-------|---------------------|-------|---------------------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | NORMAL | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|                            | NORMAL             | AXIAL | SIDE                | PITCH |                |        | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| 0                          | .006               | .710  | .155                | .023  | 90.0           | .150   |                    | -.020 | .132                | .028  | .000                | .045 |
| 5.0                        | .016               | .702  | .163                | .021  | 95.0           | .146   |                    | -.079 | .129                | .028  | .000                | .045 |
| 10.0                       | .029               | .696  | .170                | .018  | 100.0          | .143   |                    | -.127 | .127                | .028  | .000                | .046 |
| 15.0                       | .045               | .683  | .177                | .015  | 105.0          | .142   |                    | -.128 | .127                | .028  | .000                | .048 |
| 20.0                       | .062               | .672  | .179                | .014  | 110.0          | .142   |                    | -.157 | .130                | .028  | .000                | .050 |
| 25.0                       | .083               | .650  | .181                | .012  | 115.0          | .143   |                    | -.176 | .134                | .029  | .002                | .052 |
| 30.0                       | .101               | .629  | .182                | .010  | 120.0          | .143   |                    | -.190 | .141                | .031  | .001                | .055 |
| 35.0                       | .119               | .604  | .182                | .007  | 125.0          | .141   |                    | -.203 | .149                | .035  | .001                | .058 |
| 40.0                       | .134               | .577  | .180                | .005  | 130.0          | .138   |                    | -.214 | .157                | .037  | .001                | .062 |
| 45.0                       | .150               | .549  | .177                | .005  | 135.0          | .131   |                    | -.232 | .166                | .038  | .001                | .066 |
| 50.0                       | .162               | .513  | .174                | .008  | 140.0          | .122   |                    | -.249 | .175                | .034  | .000                | .070 |
| 55.0                       | .170               | .470  | .168                | .014  | 145.0          | .113   |                    | -.268 | .185                | .029  | .001                | .073 |
| 60.0                       | .173               | .420  | .164                | .023  | 150.0          | .102   |                    | -.284 | .192                | .020  | .000                | .074 |
| 65.0                       | .174               | .352  | .151                | .029  | 155.0          | .089   |                    | -.301 | .199                | .018  | .000                | .076 |
| 70.0                       | .170               | .277  | .150                | .032  | 160.0          | .075   |                    | -.423 | .205                | .014  | .001                | .077 |
| 75.0                       | .165               | .205  | .145                | .031  | 165.0          | .060   |                    | -.436 | .210                | .010  | .001                | .078 |
| 80.0                       | .160               | .130  | .140                | .030  | 170.0          | .040   |                    | -.448 | .213                | .007  | .001                | .079 |
| 85.0                       | .155               | .058  | .135                | .029  | 175.0          | .031   |                    | -.453 | .214                | .005  | .002                | .079 |
| 90.0                       | .150               | -.020 | .132                | .028  | 180.0          | .000   |                    | -.476 | .216                | .006  | .002                | .079 |

| ***AZIMUTH ANGLE = 45.0*** |                    |       |                     |       |                |        |                    |       |                     |       |                     |      |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------|--------------------|-------|---------------------|-------|---------------------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | NORMAL | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|                            | NORMAL             | AXIAL | SIDE                | PITCH |                |        | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| 0                          | .008               | .685  | .182                | .020  | 90.0           | .139   |                    | -.030 | .148                | .027  | .001                | .057 |
| 5.0                        | .016               | .675  | .190                | .019  | 95.0           | .136   |                    | -.090 | .145                | .027  | .000                | .057 |
| 10.0                       | .028               | .668  | .197                | .019  | 100.0          | .134   |                    | -.135 | .144                | .026  | .002                | .058 |
| 15.0                       | .043               | .656  | .204                | .017  | 105.0          | .133   |                    | -.130 | .144                | .027  | .001                | .059 |
| 20.0                       | .059               | .647  | .204                | .016  | 110.0          | .133   |                    | -.160 | .146                | .029  | .001                | .061 |
| 25.0                       | .079               | .626  | .205                | .014  | 115.0          | .133   |                    | -.179 | .150                | .031  | .002                | .062 |
| 30.0                       | .096               | .605  | .205                | .011  | 120.0          | .131   |                    | -.195 | .155                | .034  | .002                | .064 |
| 35.0                       | .113               | .582  | .204                | .005  | 125.0          | .127   |                    | -.210 | .161                | .037  | .003                | .066 |
| 40.0                       | .127               | .560  | .201                | .001  | 130.0          | .122   |                    | -.222 | .168                | .039  | .001                | .068 |
| 45.0                       | .141               | .541  | .196                | .000  | 135.0          | .114   |                    | -.241 | .177                | .040  | .002                | .071 |
| 50.0                       | .150               | .511  | .191                | .002  | 140.0          | .105   |                    | -.261 | .186                | .036  | .001                | .074 |
| 55.0                       | .157               | .473  | .184                | .009  | 145.0          | .095   |                    | -.279 | .194                | .031  | .003                | .077 |
| 60.0                       | .159               | .427  | .178                | .021  | 150.0          | .071   |                    | -.290 | .201                | .021  | .000                | .078 |
| 65.0                       | .160               | .360  | .171                | .029  | 155.0          | .060   |                    | -.300 | .208                | .021  | .001                | .081 |
| 70.0                       | .158               | .285  | .163                | .033  | 160.0          | .047   |                    | -.459 | .214                | .016  | .002                | .083 |
| 75.0                       | .154               | .210  | .160                | .033  | 165.0          | .030   |                    | -.450 | .220                | .012  | .001                | .085 |
| 80.0                       | .149               | .135  | .155                | .031  | 170.0          | .030   |                    | -.438 | .224                | .008  | .003                | .086 |
| 85.0                       | .144               | .063  | .151                | .029  | 175.0          | .030   |                    | -.421 | .224                | .006  | .003                | .086 |
| 90.0                       | .139               | -.030 | .148                | .027  | 180.0          | .000   |                    | -.445 | .230                | .008  | .003                | .087 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 50.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL |
| 0              | .007               | .616  | .196                | .037 | 90.0           | .120               | -.026 | .151                | .052 | .023                | .000 |
| 5.0            | .015               | .610  | .202                | .037 | 95.0           | .117               | -.073 | .149                | .053 | .024                | .000 |
| 10.0           | .025               | .603  | .208                | .037 | 100.0          | .115               | -.111 | .148                | .055 | .024                | .001 |
| 15.0           | .039               | .594  | .213                | .037 | 105.0          | .114               | -.110 | .148                | .057 | .025                | .001 |
| 20.0           | .053               | .583  | .213                | .042 | 110.0          | .113               | -.153 | .150                | .060 | .027                | .000 |
| 25.0           | .069               | .563  | .213                | .039 | 115.0          | .113               | -.172 | .155                | .062 | .028                | .000 |
| 30.0           | .085               | .542  | .212                | .040 | 120.0          | .111               | -.189 | .161                | .065 | .029                | .002 |
| 35.0           | .100               | .519  | .211                | .042 | 125.0          | .107               | -.205 | .168                | .068 | .031                | .003 |
| 40.0           | .113               | .496  | .207                | .044 | 130.0          | .103               | -.216 | .176                | .071 | .031                | .000 |
| 45.0           | .125               | .475  | .202                | .046 | 135.0          | .096               | -.232 | .185                | .075 | .031                | .000 |
| 50.0           | .132               | .447  | .197                | .049 | 140.0          | .089               | -.249 | .193                | .078 | .027                | .000 |
| 55.0           | .138               | .409  | .190                | .050 | 145.0          | .081               | -.262 | .201                | .081 | .022                | .001 |
| 60.0           | .139               | .365  | .183                | .052 | 150.0          | .072               | -.273 | .208                | .083 | .015                | .000 |
| 65.0           | .139               | .306  | .176                | .052 | 155.0          | .061               | -.283 | .214                | .086 | .014                | .000 |
| 70.0           | .137               | .242  | .168                | .052 | 160.0          | .051               | -.391 | .220                | .088 | .010                | .001 |
| 75.0           | .134               | .176  | .164                | .051 | 165.0          | .039               | -.383 | .225                | .089 | .007                | .000 |
| 80.0           | .129               | .113  | .159                | .051 | 170.0          | .025               | -.373 | .229                | .090 | .004                | .002 |
| 85.0           | .124               | .053  | .155                | .051 | 175.0          | .025               | -.364 | .230                | .090 | .003                | .003 |
| 90.0           | .120               | -.026 | .151                | .052 | 180.0          | -.001              | -.377 | .234                | .091 | .004                | .002 |

\*\*\*AZIMUTH ANGLE = 55.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL |
| 0              | .007               | .547  | .210                | .046 | 90.0           | .101               | -.023 | .155                | .048 | .020                | .000 |
| 5.0            | .014               | .545  | .215                | .046 | 95.0           | .098               | -.057 | .153                | .050 | .021                | .000 |
| 10.0           | .023               | .539  | .219                | .048 | 100.0          | .096               | -.088 | .152                | .052 | .023                | .000 |
| 15.0           | .035               | .532  | .222                | .049 | 105.0          | .095               | -.091 | .152                | .055 | .024                | .001 |
| 20.0           | .047               | .519  | .222                | .053 | 110.0          | .093               | -.146 | .155                | .059 | .025                | .000 |
| 25.0           | .060               | .500  | .222                | .052 | 115.0          | .093               | -.166 | .160                | .063 | .026                | .000 |
| 30.0           | .074               | .479  | .220                | .054 | 120.0          | .091               | -.183 | .168                | .067 | .025                | .003 |
| 35.0           | .087               | .456  | .218                | .056 | 125.0          | .088               | -.200 | .175                | .071 | .025                | .003 |
| 40.0           | .099               | .432  | .214                | .057 | 130.0          | .084               | -.210 | .184                | .074 | .023                | .000 |
| 45.0           | .109               | .409  | .209                | .057 | 135.0          | .079               | -.224 | .193                | .079 | .022                | .002 |
| 50.0           | .114               | .384  | .203                | .057 | 140.0          | .074               | -.238 | .201                | .082 | .018                | .001 |
| 55.0           | .119               | .345  | .196                | .054 | 145.0          | .067               | -.246 | .209                | .085 | .014                | .000 |
| 60.0           | .119               | .303  | .189                | .053 | 150.0          | .060               | -.256 | .215                | .088 | .009                | .001 |
| 65.0           | .119               | .252  | .181                | .050 | 155.0          | .051               | -.266 | .221                | .091 | .007                | .000 |
| 70.0           | .117               | .200  | .174                | .048 | 160.0          | .042               | -.323 | .226                | .093 | .005                | .000 |
| 75.0           | .114               | .143  | .168                | .047 | 165.0          | .032               | -.316 | .230                | .094 | .003                | .001 |
| 80.0           | .110               | .091  | .163                | .046 | 170.0          | .020               | -.308 | .234                | .095 | .000                | .001 |
| 85.0           | .105               | .043  | .159                | .047 | 175.0          | .020               | -.307 | .236                | .095 | .003                | .004 |
| 90.0           | .101               | -.023 | .155                | .048 | 180.0          | -.002              | -.310 | .239                | .096 | .001                | .001 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 60.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| .0             | .007               | .478  | .224                | .042  | 90.0           | .082               | -.020 | .159                | .017  | .000                | .044 |
| 5.0            | .014               | .481  | .228                | .042  | 95.0           | .080               | -.041 | .157                | .019  | -.001               | .047 |
| 10.0           | .021               | .475  | .231                | .042  | 100.0          | .078               | -.065 | .156                | .022  | .000                | .050 |
| 15.0           | .031               | .471  | .232                | .041  | 105.0          | .076               | -.072 | .157                | .023  | .001                | .054 |
| 20.0           | .041               | .455  | .232                | .040  | 110.0          | .074               | -.140 | .160                | .024  | .000                | .058 |
| 25.0           | .051               | .438  | .231                | .038  | 115.0          | .073               | -.160 | .166                | .024  | .002                | .064 |
| 30.0           | .063               | .417  | .228                | .035  | 120.0          | .071               | -.178 | .175                | .021  | .004                | .069 |
| 35.0           | .075               | .394  | .225                | .033  | 125.0          | .069               | -.195 | .183                | .019  | .004                | .074 |
| 40.0           | .086               | .369  | .221                | .029  | 130.0          | .066               | -.205 | .193                | .016  | .001                | .078 |
| 45.0           | .093               | .343  | .216                | .025  | 135.0          | .062               | -.216 | .202                | .013  | .004                | .083 |
| 50.0           | .097               | .321  | .210                | .015  | 140.0          | .059               | -.227 | .209                | .009  | -.002               | .087 |
| 55.0           | .100               | .281  | .203                | .018  | 145.0          | .053               | -.230 | .217                | .006  | -.001               | .090 |
| 60.0           | .100               | .241  | .195                | .015  | 150.0          | .048               | -.239 | .223                | .004  | .002                | .093 |
| 65.0           | .099               | .199  | .187                | .014  | 155.0          | .041               | -.250 | .228                | .001  | .000                | .096 |
| 70.0           | .097               | .158  | .180                | .013  | 160.0          | .034               | -.255 | .232                | .000  | .000                | .098 |
| 75.0           | .095               | .110  | .173                | .012  | 165.0          | .025               | -.250 | .236                | -.001 | -.002               | .099 |
| 80.0           | .091               | .070  | .167                | .013  | 170.0          | .016               | -.243 | .240                | -.004 | .000                | .100 |
| 85.0           | .086               | .033  | .163                | .015  | 175.0          | .016               | -.250 | .242                | -.003 | -.005               | .100 |
| 90.0           | .082               | -.020 | .159                | .017  | 180.0          | -.004              | -.243 | .244                | -.002 | .000                | .101 |

\*\*\*AZIMUTH ANGLE = 65.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW  |
| .0             | .007               | .389  | .221                | .036  | 90.0           | .067               | -.026 | .159                | .007  | .000                | .053 |
| 5.0            | .012               | .394  | .224                | .036  | 95.0           | .066               | -.041 | .157                | .007  | .000                | .055 |
| 10.0           | .018               | .390  | .227                | .034  | 100.0          | .065               | -.065 | .157                | .008  | .000                | .057 |
| 15.0           | .026               | .384  | .227                | .033  | 105.0          | .063               | -.074 | .157                | .008  | .002                | .060 |
| 20.0           | .034               | .372  | .227                | .030  | 110.0          | .062               | -.125 | .160                | .009  | -.001               | .063 |
| 25.0           | .042               | .357  | .227                | .027  | 115.0          | .061               | -.138 | .164                | .009  | .002                | .067 |
| 30.0           | .052               | .340  | .224                | .024  | 120.0          | .059               | -.161 | .171                | .006  | .001                | .070 |
| 35.0           | .061               | .322  | .218                | .022  | 125.0          | .057               | -.171 | .177                | .005  | -.002               | .074 |
| 40.0           | .070               | .303  | .213                | .019  | 130.0          | .054               | -.180 | .184                | .003  | .001                | .077 |
| 45.0           | .075               | .281  | .213                | .017  | 135.0          | .050               | -.189 | .191                | .001  | .001                | .080 |
| 50.0           | .077               | .262  | .207                | .011  | 140.0          | .047               | -.198 | .196                | -.001 | -.002               | .083 |
| 55.0           | .079               | .230  | .200                | .014  | 145.0          | .042               | -.203 | .203                | -.003 | -.001               | .085 |
| 60.0           | .078               | .197  | .193                | .012  | 150.0          | .038               | -.211 | .207                | -.005 | .002                | .086 |
| 65.0           | .077               | .162  | .185                | .012  | 155.0          | .032               | -.219 | .212                | -.007 | .000                | .088 |
| 70.0           | .076               | .128  | .178                | .010  | 160.0          | .026               | -.223 | .215                | -.008 | -.001               | .090 |
| 75.0           | .075               | .096  | .172                | .009  | 165.0          | .018               | -.220 | .218                | -.008 | -.001               | .091 |
| 80.0           | .073               | .055  | .167                | .007  | 170.0          | .011               | -.216 | .221                | -.010 | .000                | .091 |
| 85.0           | .070               | .022  | .163                | .007  | 175.0          | .010               | -.215 | .222                | -.009 | -.003               | .091 |
| 90.0           | .067               | -.026 | .159                | .007  | 180.0          | -.005              | -.215 | .224                | -.008 | -.001               | .092 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 70.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW  |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL | YAW  |
| 0              | .007               | .300  | .218                | .030  | 90.0           | .053               | -.033 | .160                | -.003 | .001 | .062 |
| 5.0            | .010               | .307  | .221                | .030  | 95.0           | .052               | -.041 | .158                | -.005 | .000 | .063 |
| 10.0           | .015               | .305  | .223                | .027  | 100.0          | .052               | -.065 | .158                | -.005 | .000 | .065 |
| 15.0           | .021               | .297  | .223                | .025  | 105.0          | .051               | -.076 | .158                | -.005 | .003 | .066 |
| 20.0           | .028               | .289  | .223                | .020  | 110.0          | .050               | -.110 | .160                | -.006 | .002 | .068 |
| 25.0           | .034               | .277  | .223                | .016  | 115.0          | .049               | -.116 | .162                | -.005 | .002 | .070 |
| 30.0           | .041               | .264  | .221                | .013  | 120.0          | .047               | -.145 | .167                | -.007 | .000 | .072 |
| 35.0           | .048               | .251  | .219                | .011  | 125.0          | .045               | -.148 | .171                | -.009 | .000 | .074 |
| 40.0           | .054               | .237  | .215                | .009  | 130.0          | .042               | -.155 | .176                | -.010 | .001 | .076 |
| 45.0           | .057               | .219  | .211                | .009  | 135.0          | .039               | -.162 | .180                | -.011 | .000 | .078 |
| 50.0           | .058               | .203  | .204                | .007  | 140.0          | .036               | -.170 | .184                | -.012 | .003 | .079 |
| 55.0           | .058               | .179  | .198                | .010  | 145.0          | .032               | -.176 | .189                | -.013 | .001 | .080 |
| 60.0           | .056               | .153  | .191                | .010  | 150.0          | .028               | -.183 | .192                | -.014 | .002 | .080 |
| 65.0           | .056               | .126  | .183                | .010  | 155.0          | .023               | -.188 | .196                | -.015 | .001 | .081 |
| 70.0           | .056               | .099  | .177                | .008  | 160.0          | .018               | -.191 | .198                | -.014 | .002 | .082 |
| 75.0           | .056               | .083  | .171                | .006  | 165.0          | .012               | -.190 | .200                | -.015 | .000 | .082 |
| 80.0           | .055               | .040  | .167                | .002  | 170.0          | .006               | -.189 | .202                | -.016 | .001 | .083 |
| 85.0           | .054               | .011  | .163                | .001  | 175.0          | .004               | -.181 | .203                | -.015 | .001 | .083 |
| 90.0           | .053               | -.033 | .160                | -.003 | 180.0          | -.007              | -.187 | .204                | -.015 | .002 | .084 |

\*\*\*AZIMUTH ANGLE = 75.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW  |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL | YAW  |
| 0              | .007               | .211  | .216                | .025  | 90.0           | .039               | -.040 | .161                | -.013 | .002 | .072 |
| 5.0            | .008               | .220  | .218                | .024  | 95.0           | .039               | -.042 | .159                | -.017 | .001 | .072 |
| 10.0           | .013               | .220  | .219                | .020  | 100.0          | .039               | -.065 | .159                | -.019 | .001 | .073 |
| 15.0           | .017               | .211  | .219                | .017  | 105.0          | .039               | -.079 | .159                | -.020 | .004 | .073 |
| 20.0           | .022               | .206  | .219                | .010  | 110.0          | .039               | -.095 | .160                | -.021 | .003 | .073 |
| 25.0           | .026               | .197  | .219                | .006  | 115.0          | .037               | -.095 | .161                | -.020 | .003 | .074 |
| 30.0           | .030               | .188  | .218                | .003  | 120.0          | .036               | -.129 | .163                | -.022 | .003 | .074 |
| 35.0           | .035               | .180  | .216                | .001  | 125.0          | .034               | -.125 | .165                | -.023 | .001 | .074 |
| 40.0           | .038               | .171  | .213                | .000  | 130.0          | .031               | -.130 | .168                | -.023 | .001 | .075 |
| 45.0           | .040               | .158  | .209                | .001  | 135.0          | .028               | -.136 | .170                | -.023 | .003 | .076 |
| 50.0           | .039               | .144  | .202                | .004  | 140.0          | .025               | -.142 | .172                | -.023 | .004 | .075 |
| 55.0           | .037               | .129  | .196                | .006  | 145.0          | .022               | -.150 | .175                | -.023 | .001 | .075 |
| 60.0           | .035               | .110  | .189                | .008  | 150.0          | .018               | -.155 | .177                | -.023 | .003 | .074 |
| 65.0           | .035               | .090  | .182                | .008  | 155.0          | .015               | -.158 | .180                | -.023 | .002 | .074 |
| 70.0           | .036               | .070  | .176                | .006  | 160.0          | .011               | -.160 | .181                | -.022 | .004 | .074 |
| 75.0           | .037               | .070  | .171                | .003  | 165.0          | .006               | -.161 | .183                | -.022 | .001 | .074 |
| 80.0           | .038               | .025  | .167                | .003  | 170.0          | .002               | -.162 | .184                | -.022 | .002 | .075 |
| 85.0           | .039               | .000  | .163                | .009  | 175.0          | -.002              | -.147 | .184                | -.021 | .000 | .075 |
| 90.0           | .039               | -.040 | .161                | .013  | 180.0          | -.009              | -.160 | .184                | -.022 | .004 | .076 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 80.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL  | YAW  |
| 0              | .006               | .116  | .198                | .023  | 90.0           | .026               | -.040 | -.009               | .001 | -.009               | .001  | .060 |
| 5.0            | .006               | .123  | .199                | .021  | 95.0           | .026               | -.038 | -.012               | .001 | -.012               | .001  | .060 |
| 10.0           | .010               | .125  | .200                | .017  | 100.0          | .025               | -.054 | -.012               | .000 | -.012               | .000  | .061 |
| 15.0           | .012               | .121  | .200                | .013  | 105.0          | .025               | -.063 | -.013               | .003 | -.013               | .003  | .061 |
| 20.0           | .015               | .119  | .200                | .008  | 110.0          | .025               | -.074 | -.014               | .001 | -.014               | -.002 | .061 |
| 25.0           | .018               | .115  | .200                | .005  | 115.0          | .024               | -.074 | -.013               | .001 | -.013               | .001  | .063 |
| 30.0           | .020               | .110  | .199                | .002  | 120.0          | .023               | -.097 | -.015               | .001 | -.015               | .001  | .063 |
| 35.0           | .024               | .106  | .197                | .000  | 125.0          | .022               | -.095 | -.016               | .000 | -.016               | .000  | .062 |
| 40.0           | .026               | .101  | .194                | .000  | 130.0          | .020               | -.103 | -.015               | .001 | -.015               | .001  | .062 |
| 45.0           | .027               | .093  | .191                | .000  | 135.0          | .016               | -.108 | -.015               | .002 | -.015               | .002  | .063 |
| 50.0           | .026               | .084  | .185                | .001  | 140.0          | .016               | -.114 | -.016               | .003 | -.016               | .003  | .062 |
| 55.0           | .025               | .074  | .180                | .004  | 145.0          | .014               | -.118 | -.017               | .001 | -.017               | .001  | .062 |
| 60.0           | .024               | .062  | .175                | .005  | 150.0          | .011               | -.122 | -.018               | .001 | -.018               | .001  | .062 |
| 65.0           | .024               | .049  | .170                | .005  | 155.0          | .009               | -.124 | -.020               | .000 | -.020               | .000  | .063 |
| 70.0           | .025               | .036  | .166                | .004  | 160.0          | .006               | -.126 | -.021               | .000 | -.021               | .000  | .064 |
| 75.0           | .025               | .036  | .163                | .002  | 165.0          | .003               | -.120 | -.021               | .000 | -.021               | .000  | .065 |
| 80.0           | .026               | .006  | .161                | -.002 | 170.0          | .000               | -.130 | -.022               | .000 | -.022               | .000  | .066 |
| 85.0           | .026               | -.009 | .159                | -.006 | 175.0          | -.002              |       |                     |      |                     |       |      |
| 90.0           | .026               | -.040 | .158                | -.009 | 180.0          | -.007              |       |                     |      |                     |       |      |

\*\*\*AZIMUTH ANGLE = 85.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL | YAW  |
| 0              | .005               | .021  | .180                | .021  | 90.0           | .013               | -.041 | -.005               | .000 | -.005               | .000 | .049 |
| 5.0            | .005               | .027  | .180                | .018  | 95.0           | .013               | -.035 | -.007               | .001 | -.007               | .001 | .049 |
| 10.0           | .007               | .030  | .181                | .014  | 100.0          | .012               | -.043 | -.006               | .002 | -.006               | .002 | .049 |
| 15.0           | .008               | .031  | .181                | .010  | 105.0          | .012               | -.048 | -.006               | .003 | -.006               | .003 | .049 |
| 20.0           | .009               | .032  | .181                | .006  | 110.0          | .011               | -.053 | -.007               | .001 | -.007               | .001 | .050 |
| 25.0           | .010               | .033  | .181                | .004  | 115.0          | .011               | -.053 | -.006               | .001 | -.006               | .001 | .052 |
| 30.0           | .011               | .032  | .180                | .002  | 120.0          | .010               | -.055 | -.008               | .000 | -.008               | .000 | .052 |
| 35.0           | .013               | .032  | .178                | .000  | 125.0          | .010               | -.065 | -.009               | .000 | -.009               | .000 | .051 |
| 40.0           | .014               | .031  | .176                | -.001 | 130.0          | .009               | -.067 | -.008               | .001 | -.008               | .001 | .050 |
| 45.0           | .014               | .028  | .173                | -.001 | 135.0          | .008               | -.070 | -.007               | .001 | -.007               | .001 | .050 |
| 50.0           | .014               | .024  | .169                | .000  | 140.0          | .007               | -.074 | -.007               | .003 | -.007               | .003 | .049 |
| 55.0           | .013               | .019  | .165                | .002  | 145.0          | .006               | -.078 | -.010               | .001 | -.010               | .001 | .049 |
| 60.0           | .013               | .014  | .161                | .003  | 150.0          | .004               | -.082 | -.011               | .000 | -.011               | .000 | .049 |
| 65.0           | .013               | .008  | .159                | .003  | 155.0          | .003               | -.086 | -.013               | .001 | -.013               | .001 | .050 |
| 70.0           | .014               | .002  | .157                | .002  | 160.0          | .001               | -.088 | -.015               | .000 | -.015               | .000 | .050 |
| 75.0           | .014               | .002  | .156                | .001  | 165.0          | .000               | -.092 | -.018               | .001 | -.018               | .001 | .052 |
| 80.0           | .014               | -.013 | .156                | -.002 | 170.0          | -.001              | -.094 | -.020               | .000 | -.020               | .000 | .053 |
| 85.0           | .014               | -.018 | .156                | -.004 | 175.0          | -.002              | -.093 | -.021               | .000 | -.021               | .000 | .055 |
| 90.0           | .013               | -.041 | .155                | -.005 | 180.0          | -.005              | -.101 | -.022               | .000 | -.022               | .000 | .056 |



Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 90.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE |       |       | FORCE COEFFICIENTS |       |       | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|-------|-------|--------------------|-------|-------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                |       |       | NORMAL             | AXIAL | SIDE  | PITCH               | ROLL  | YAW  |
| 0              | .004               | -.074 | .103 | .019                | -.002 | .045 | 90.0           | .001  | -.042 | .153               | -.002 | -.001 | -.002               | -.001 | .038 |
| 5.0            | .004               | -.069 | .102 | .016                | .001  | .044 | 95.0           | .000  | -.032 | .153               | -.002 | .001  | -.002               | .001  | .038 |
| 10.0           | .004               | -.064 | .103 | .011                | .002  | .043 | 100.0          | -.001 | -.033 | .152               | .000  | -.004 | .000                | -.004 | .037 |
| 15.0           | .004               | -.059 | .103 | .007                | .002  | .042 | 105.0          | -.001 | -.033 | .152               | .000  | .003  | .000                | .003  | .038 |
| 20.0           | .003               | -.054 | .102 | .005                | .001  | .040 | 110.0          | -.002 | -.033 | .150               | .000  | -.001 | .000                | -.001 | .039 |
| 25.0           | .003               | -.049 | .102 | .004                | .000  | .038 | 115.0          | -.002 | -.033 | .149               | .000  | -.003 | .000                | -.003 | .041 |
| 30.0           | .002               | -.046 | .101 | .002                | .002  | .037 | 120.0          | -.003 | -.033 | .148               | -.002 | .002  | -.002               | .002  | .041 |
| 35.0           | .002               | -.042 | .100 | .000                | .000  | .036 | 125.0          | -.002 | -.035 | .149               | -.002 | .000  | -.002               | .000  | .040 |
| 40.0           | .002               | -.039 | .100 | -.002               | -.001 | .035 | 130.0          | -.002 | -.036 | .151               | -.001 | .002  | -.001               | .002  | .038 |
| 45.0           | .002               | -.037 | .100 | -.002               | .001  | .035 | 135.0          | -.002 | -.038 | .153               | .000  | .001  | -.001               | .000  | .037 |
| 50.0           | .002               | -.036 | .100 | -.003               | -.002 | .037 | 140.0          | -.002 | -.040 | .156               | .000  | -.003 | .000                | -.003 | .036 |
| 55.0           | .002               | -.035 | .100 | .000                | .000  | .039 | 145.0          | -.002 | -.043 | .158               | -.004 | -.001 | -.004               | -.001 | .036 |
| 60.0           | .002               | -.033 | .100 | .001                | .001  | .041 | 150.0          | -.003 | -.046 | .160               | -.006 | .002  | -.006               | .002  | .037 |
| 65.0           | .002               | -.032 | .100 | .001                | -.003 | .042 | 155.0          | -.003 | -.050 | .167               | -.008 | -.001 | -.008               | -.001 | .038 |
| 70.0           | .003               | -.032 | .100 | .001                | -.002 | .040 | 160.0          | -.003 | -.053 | .164               | -.012 | .001  | -.012               | .001  | .039 |
| 75.0           | .003               | -.032 | .100 | .000                | .001  | .038 | 165.0          | -.003 | -.058 | .166               | -.016 | -.002 | -.016               | -.002 | .041 |
| 80.0           | .003               | -.032 | .100 | -.002               | .000  | .038 | 170.0          | -.003 | -.061 | .167               | -.019 | .003  | -.019               | .003  | .043 |
| 85.0           | .002               | -.028 | .100 | -.002               | -.001 | .038 | 175.0          | -.003 | -.067 | .167               | -.021 | .001  | -.021               | .001  | .045 |
| 90.0           | .001               | -.042 | .100 | -.002               | -.001 | .038 | 180.0          | -.003 | -.072 | .166               | -.022 | .002  | -.022               | .002  | .046 |

\*\*\*AZIMUTH ANGLE = 95.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE |       |       | FORCE COEFFICIENTS |       |       | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|-------|-------|--------------------|-------|-------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                |       |       | NORMAL             | AXIAL | SIDE  | PITCH               | ROLL  | YAW  |
| 0              | .005               | -.102 | .170 | .020                | -.002 | .055 | 90.0           | -.012 | -.041 | .155               | .003  | .000  | .003                | .000  | .049 |
| 5.0            | .003               | -.095 | .169 | .017                | .000  | .054 | 95.0           | -.013 | -.021 | .156               | .001  | .001  | .001                | .001  | .049 |
| 10.0           | .002               | -.096 | .170 | .014                | .000  | .053 | 100.0          | -.013 | -.013 | .157               | .001  | -.002 | .001                | -.002 | .048 |
| 15.0           | .000               | -.093 | .169 | .012                | .001  | .052 | 105.0          | -.013 | .001  | .158               | -.001 | .001  | -.001               | .001  | .049 |
| 20.0           | -.001              | -.089 | .168 | .010                | .000  | .051 | 110.0          | -.013 | .001  | .158               | -.002 | .000  | -.002               | .000  | .049 |
| 25.0           | -.003              | -.085 | .168 | .010                | .000  | .050 | 115.0          | -.013 | .008  | .160               | -.002 | -.002 | -.002               | -.002 | .050 |
| 30.0           | -.004              | -.082 | .166 | .009                | .002  | .049 | 120.0          | -.013 | .014  | .161               | -.004 | .002  | -.004               | .002  | .050 |
| 35.0           | -.006              | -.078 | .165 | .007                | .000  | .049 | 125.0          | -.013 | .019  | .164               | -.003 | .000  | -.003               | .000  | .049 |
| 40.0           | -.007              | -.073 | .162 | .006                | -.002 | .048 | 130.0          | -.014 | .024  | .168               | -.002 | .001  | -.002               | .001  | .047 |
| 45.0           | -.008              | -.070 | .160 | .006                | .000  | .048 | 135.0          | -.014 | .027  | .171               | -.001 | .000  | -.001               | .000  | .046 |
| 50.0           | -.009              | -.067 | .158 | .005                | -.001 | .049 | 140.0          | -.014 | .030  | .175               | .000  | -.001 | .000                | -.001 | .045 |
| 55.0           | -.010              | -.065 | .155 | .007                | .000  | .050 | 145.0          | -.013 | .031  | .177               | -.003 | .000  | -.003               | .000  | .044 |
| 60.0           | -.010              | -.065 | .153 | .008                | .001  | .052 | 150.0          | -.012 | .032  | .179               | -.005 | .000  | -.005               | .000  | .045 |
| 65.0           | -.011              | -.053 | .152 | .007                | -.001 | .052 | 155.0          | -.010 | .032  | .180               | -.007 | .000  | -.007               | .000  | .046 |
| 70.0           | -.011              | -.053 | .152 | .007                | -.002 | .051 | 160.0          | -.009 | .033  | .182               | -.011 | .001  | -.011               | .001  | .047 |
| 75.0           | -.011              | -.047 | .152 | .006                | .002  | .049 | 165.0          | -.007 | .031  | .183               | -.016 | .000  | -.016               | .000  | .048 |
| 80.0           | -.011              | -.043 | .153 | .005                | .000  | .049 | 170.0          | -.006 | .032  | .184               | -.019 | .003  | -.019               | .003  | .050 |
| 85.0           | -.011              | -.032 | .155 | .004                | .000  | .049 | 175.0          | -.004 | .028  | .184               | -.022 | .001  | -.022               | .001  | .052 |
| 90.0           | -.012              | -.041 | .155 | .003                | .000  | .049 | 180.0          | -.004 | .022  | .182               | -.023 | .001  | -.023               | .001  | .053 |

Table A-1 cont'd

| ***AZIMUTH ANGLE = 100.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL |      |
| 0                           | .007               | -.131 | .021                | -.003 | 90.0           | -.025              | -.040 | .008                | .001 | .008                | .001 | .060 |
| 5.0                         | .002               | -.121 | .019                | .000  | 95.0           | -.026              | -.010 | .005                | .002 | .005                | .002 | .060 |
| 10.0                        | .000               | -.129 | .018                | .000  | 100.0          | -.025              | .005  | .002                | .000 | .002                | .000 | .059 |
| 15.0                        | -.002              | -.127 | .017                | .001  | 105.0          | -.025              | .035  | -.002               | .000 | -.002               | .000 | .060 |
| 20.0                        | -.006              | -.124 | .016                | -.002 | 110.0          | -.024              | .035  | -.004               | .001 | -.004               | .001 | .059 |
| 25.0                        | -.009              | -.121 | .016                | -.001 | 115.0          | -.024              | .049  | -.005               | .001 | -.005               | .001 | .059 |
| 30.0                        | -.011              | -.118 | .016                | .002  | 120.0          | -.024              | .062  | -.006               | .002 | -.006               | .002 | .059 |
| 35.0                        | -.014              | -.114 | .015                | .000  | 125.0          | -.025              | .074  | -.004               | .000 | -.004               | .000 | .058 |
| 40.0                        | -.016              | -.107 | .014                | -.003 | 130.0          | -.026              | .084  | -.003               | .001 | -.003               | .001 | .056 |
| 45.0                        | -.018              | -.103 | .014                | -.001 | 135.0          | -.027              | .092  | .001                | .000 | .001                | .000 | .055 |
| 50.0                        | -.020              | -.098 | .014                | .000  | 140.0          | -.026              | .100  | .000                | .000 | .000                | .000 | .054 |
| 55.0                        | -.022              | -.095 | .015                | .000  | 145.0          | -.024              | .105  | .002                | .001 | .002                | .001 | .053 |
| 60.0                        | -.023              | -.097 | .015                | .001  | 150.0          | -.021              | .110  | -.004               | .000 | -.004               | .000 | .053 |
| 65.0                        | -.024              | -.074 | .013                | .001  | 155.0          | -.018              | .114  | -.006               | .001 | -.006               | .001 | .054 |
| 70.0                        | -.025              | -.074 | .014                | -.002 | 160.0          | -.015              | .119  | -.010               | .001 | -.010               | .001 | .055 |
| 75.0                        | -.025              | -.063 | .013                | .003  | 165.0          | -.012              | .121  | -.016               | .002 | -.016               | .002 | .056 |
| 80.0                        | -.025              | -.054 | .012                | .000  | 170.0          | -.009              | .126  | -.019               | .003 | -.019               | .003 | .057 |
| 85.0                        | -.025              | -.037 | .010                | .000  | 175.0          | -.006              | .124  | -.023               | .002 | -.023               | .002 | .059 |
| 90.0                        | -.025              | -.040 | .008                | .001  | 180.0          | -.005              | .116  | -.024               | .000 | -.024               | .000 | .061 |
| ***AZIMUTH ANGLE = 105.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL |      |
| 0                           | .009               | -.160 | .022                | -.004 | 90.0           | -.039              | -.040 | .013                | .002 | .013                | .002 | .072 |
| 5.0                         | .002               | -.147 | .021                | .000  | 95.0           | -.039              | .000  | .009                | .003 | .009                | .003 | .072 |
| 10.0                        | -.002              | -.162 | .022                | -.002 | 100.0          | -.038              | .025  | .003                | .001 | .003                | .001 | .071 |
| 15.0                        | -.008              | -.161 | .022                | .001  | 105.0          | -.037              | .070  | -.003               | .001 | -.003               | .001 | .071 |
| 20.0                        | -.011              | -.160 | .022                | -.004 | 110.0          | -.036              | .070  | -.006               | .002 | -.006               | .002 | .070 |
| 25.0                        | -.015              | -.158 | .023                | -.002 | 115.0          | -.035              | .090  | -.008               | .001 | -.008               | .001 | .069 |
| 30.0                        | -.018              | -.155 | .023                | .003  | 120.0          | -.035              | .110  | -.008               | .002 | -.008               | .002 | .068 |
| 35.0                        | -.022              | -.150 | .023                | .001  | 125.0          | -.037              | .129  | -.006               | .001 | -.006               | .001 | .067 |
| 40.0                        | -.025              | -.142 | .023                | -.004 | 130.0          | -.039              | .144  | -.004               | .001 | -.004               | .001 | .066 |
| 45.0                        | -.028              | -.136 | .023                | .003  | 135.0          | -.040              | .158  | .001                | .001 | .001                | .001 | .064 |
| 50.0                        | -.031              | -.130 | .023                | .001  | 140.0          | -.038              | .171  | .000                | .001 | .000                | .001 | .063 |
| 55.0                        | -.034              | -.125 | .023                | .001  | 145.0          | -.035              | .180  | -.001               | .002 | -.001               | .002 | .062 |
| 60.0                        | -.036              | -.129 | .022                | .002  | 150.0          | -.030              | .188  | -.003               | .002 | -.003               | .002 | .062 |
| 65.0                        | -.037              | -.095 | .020                | .003  | 155.0          | -.026              | .197  | -.006               | .002 | -.006               | .002 | .063 |
| 70.0                        | -.039              | -.095 | .021                | -.003 | 160.0          | -.022              | .206  | -.017               | .004 | -.017               | .004 | .063 |
| 75.0                        | -.039              | -.079 | .020                | .004  | 165.0          | -.017              | .211  | -.020               | .004 | -.020               | .004 | .064 |
| 80.0                        | -.039              | -.065 | .019                | .001  | 170.0          | -.013              | .220  | -.024               | .003 | -.024               | .003 | .065 |
| 85.0                        | -.039              | -.042 | .017                | .001  | 175.0          | -.008              | .220  | -.024               | .003 | -.024               | .003 | .067 |
| 90.0                        | -.039              | -.040 | .013                | .002  | 180.0          | -.007              | .211  | -.025               | .001 | -.025               | .001 | .069 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 110.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |       |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|-------|-------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | ROLL               | YAW   | NORMAL              | AXIAL | SIDE  | PITCH | ROLL |
| 0              | .007               | -.187 | .204                | .015  | 90.0           | -.053              | -.033 | .160                | .003  | .001  | .001  | .062 |
| 5.0            | -.004              | -.181 | .203                | .015  | 95.0           | -.054              | .011  | .163                | .001  | .002  | .002  | .062 |
| 10.0           | -.006              | -.189 | .202                | .016  | 100.0          | -.055              | .040  | .167                | -.002 | .000  | .000  | .061 |
| 15.0           | -.012              | -.190 | .200                | .015  | 105.0          | -.056              | .083  | .171                | -.006 | -.001 | -.001 | .061 |
| 20.0           | -.018              | -.191 | .198                | .014  | 110.0          | -.056              | .099  | .177                | -.008 | .001  | .001  | .061 |
| 25.0           | -.023              | -.188 | .196                | .015  | 115.0          | -.056              | .126  | .183                | -.010 | .000  | .000  | .062 |
| 30.0           | -.028              | -.183 | .192                | .014  | 120.0          | -.056              | .153  | .191                | -.010 | .002  | .002  | .063 |
| 35.0           | -.032              | -.176 | .189                | .013  | 125.0          | -.058              | .179  | .198                | -.010 | .000  | .000  | .064 |
| 40.0           | -.036              | -.170 | .184                | .012  | 130.0          | -.058              | .203  | .204                | -.007 | .002  | .002  | .065 |
| 45.0           | -.039              | -.162 | .180                | .011  | 135.0          | -.057              | .219  | .211                | -.009 | .000  | .000  | .065 |
| 50.0           | -.042              | -.155 | .176                | .010  | 140.0          | -.054              | .237  | .215                | -.009 | .001  | .001  | .065 |
| 55.0           | -.045              | -.148 | .171                | .009  | 145.0          | -.048              | .251  | .219                | -.011 | .002  | .002  | .064 |
| 60.0           | -.047              | -.145 | .167                | .007  | 150.0          | -.041              | .264  | .221                | -.013 | .001  | .001  | .064 |
| 65.0           | -.049              | -.116 | .162                | .005  | 155.0          | -.034              | .277  | .223                | -.016 | .000  | .000  | .064 |
| 70.0           | -.050              | -.110 | .160                | .006  | 160.0          | -.028              | .289  | .223                | -.020 | .003  | .003  | .063 |
| 75.0           | -.051              | -.076 | .158                | .003  | 165.0          | -.021              | .297  | .223                | -.025 | .005  | .005  | .063 |
| 80.0           | -.052              | -.065 | .158                | .005  | 170.0          | -.015              | .305  | .223                | -.027 | .004  | .004  | .063 |
| 85.0           | -.052              | -.041 | .158                | .005  | 175.0          | -.010              | .307  | .221                | -.030 | .002  | .002  | .063 |
| 90.0           | -.053              | -.033 | .160                | .003  | 180.0          | -.007              | .300  | .218                | -.030 | .000  | .000  | .064 |

\*\*\*AZIMUTH ANGLE = 115.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | ROLL               | YAW   | NORMAL              | AXIAL |                | SIDE               | PITCH | ROLL                | YAW  |
| 0              | .005               | -.215 | .224                | .008  | -.001          | .092               | -.067 | -.026               | .159  | -.007          | .000               | .000  | .000                | .053 |
| 5.0            | -.010              | -.215 | .222                | .009  | -.003          | .091               | -.070 | .022                | .163  | -.007          | .002               | .000  | .002                | .052 |
| 10.0           | -.011              | -.216 | .221                | .010  | .000           | .091               | -.073 | .055                | .167  | -.007          | .000               | .000  | .000                | .051 |
| 15.0           | -.018              | -.220 | .218                | .008  | -.001          | .090               | -.075 | .096                | .172  | -.009          | .000               | .000  | .000                | .052 |
| 20.0           | -.026              | -.223 | .215                | .007  | -.001          | .090               | -.076 | .128                | .178  | -.010          | .000               | .000  | .000                | .053 |
| 25.0           | -.032              | -.219 | .212                | .007  | .000           | .088               | -.077 | .162                | .185  | -.012          | .000               | .000  | .000                | .055 |
| 30.0           | -.038              | -.211 | .207                | .005  | .002           | .086               | -.078 | .197                | .193  | -.012          | .002               | .000  | .002                | .058 |
| 35.0           | -.042              | -.203 | .203                | .003  | -.001          | .085               | -.079 | .230                | .200  | -.014          | .001               | .000  | .001                | .061 |
| 40.0           | -.047              | -.198 | .196                | .001  | -.002          | .083               | -.077 | .262                | .207  | -.011          | .003               | .000  | .003                | .065 |
| 45.0           | -.050              | -.189 | .191                | -.001 | .001           | .080               | -.075 | .281                | .213  | -.000          | .017               | .000  | .017                | .067 |
| 50.0           | -.054              | -.180 | .184                | -.003 | .001           | .077               | -.070 | .303                | .218  | -.019          | .002               | .000  | .002                | .067 |
| 55.0           | -.057              | -.171 | .177                | -.005 | -.002          | .074               | -.061 | .322                | .222  | -.022          | .002               | .000  | .002                | .067 |
| 60.0           | -.059              | -.161 | .171                | -.006 | -.001          | .070               | -.052 | .340                | .224  | -.024          | .000               | .000  | .000                | .066 |
| 65.0           | -.061              | -.138 | .164                | -.009 | .002           | .067               | -.042 | .357                | .227  | -.027          | .002               | .000  | .002                | .065 |
| 70.0           | -.062              | -.125 | .160                | -.009 | -.001          | .063               | -.034 | .372                | .227  | -.030          | .004               | .000  | .004                | .063 |
| 75.0           | -.063              | -.074 | .157                | -.008 | .002           | .060               | -.026 | .384                | .227  | -.033          | .006               | .000  | .006                | .062 |
| 80.0           | -.065              | -.065 | .157                | -.008 | .000           | .057               | -.018 | .390                | .227  | -.034          | .005               | .000  | .005                | .061 |
| 85.0           | -.066              | -.041 | .157                | -.007 | .000           | .055               | -.012 | .394                | .224  | -.036          | .001               | .000  | .001                | .059 |
| 90.0           | -.067              | -.026 | .159                | -.007 | .000           | .053               | -.007 | .389                | .221  | -.036          | .000               | .000  | .000                | .059 |

Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 120.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW |
|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|
| 0              | .004                         | -.243                       | .244                       | .002                         | .000                        | .101                       | 90.0           | -.082                        | -.020                       | .159                       | -.017                        | .000                        | .044                       |
| 5.0            | -.016                        | -.250                       | .242                       | .003                         | -.005                       | .100                       | 95.0           | -.086                        | .033                        | .163                       | -.015                        | .002                        | .043                       |
| 10.0           | -.016                        | -.243                       | .240                       | .004                         | .000                        | .100                       | 100.0          | -.091                        | .070                        | .167                       | -.013                        | -.001                       | .042                       |
| 15.0           | -.025                        | -.250                       | .236                       | .001                         | -.002                       | .099                       | 105.0          | -.095                        | .110                        | .173                       | -.012                        | .000                        | .043                       |
| 20.0           | -.034                        | -.255                       | .232                       | .000                         | .000                        | .098                       | 110.0          | -.097                        | .158                        | .180                       | -.013                        | .000                        | .045                       |
| 25.0           | -.041                        | -.250                       | .228                       | -.001                        | .000                        | .096                       | 115.0          | -.099                        | .199                        | .187                       | -.014                        | .000                        | .049                       |
| 30.0           | -.048                        | -.239                       | .223                       | -.004                        | .002                        | .093                       | 120.0          | -.100                        | .241                        | .195                       | -.015                        | .002                        | .054                       |
| 35.0           | -.053                        | -.230                       | .217                       | -.006                        | -.001                       | .090                       | 125.0          | -.100                        | .281                        | .203                       | -.018                        | .002                        | .058                       |
| 40.0           | -.059                        | -.227                       | .209                       | -.009                        | -.002                       | .087                       | 130.0          | -.097                        | .321                        | .210                       | -.015                        | .004                        | .065                       |
| 45.0           | -.062                        | -.216                       | .202                       | -.013                        | .004                        | .083                       | 135.0          | -.093                        | .343                        | .216                       | -.025                        | .000                        | .069                       |
| 50.0           | -.066                        | -.205                       | .193                       | -.016                        | .001                        | .078                       | 140.0          | -.086                        | .369                        | .221                       | -.029                        | .003                        | .070                       |
| 55.0           | -.069                        | -.195                       | .183                       | -.019                        | -.004                       | .074                       | 145.0          | -.075                        | .394                        | .225                       | -.033                        | .002                        | .070                       |
| 60.0           | -.071                        | -.178                       | .175                       | -.021                        | -.003                       | .069                       | 150.0          | -.063                        | .417                        | .228                       | -.035                        | -.001                       | .068                       |
| 65.0           | -.073                        | -.160                       | .166                       | -.024                        | .002                        | .064                       | 155.0          | -.051                        | .438                        | .231                       | -.038                        | .004                        | .066                       |
| 70.0           | -.074                        | -.140                       | .160                       | -.024                        | .000                        | .058                       | 160.0          | -.041                        | .455                        | .232                       | -.040                        | .006                        | .064                       |
| 75.0           | -.076                        | -.072                       | .157                       | -.023                        | .001                        | .054                       | 165.0          | -.031                        | .471                        | .232                       | -.041                        | .007                        | .061                       |
| 80.0           | -.078                        | -.065                       | .156                       | -.022                        | .000                        | .050                       | 170.0          | -.021                        | .475                        | .231                       | -.042                        | .006                        | .059                       |
| 85.0           | -.080                        | -.041                       | .157                       | -.019                        | -.001                       | .047                       | 175.0          | -.014                        | .481                        | .228                       | -.042                        | .000                        | .056                       |
| 90.0           | -.082                        | -.020                       | .159                       | -.017                        | .000                        | .044                       | 180.0          | -.007                        | .478                        | .224                       | -.042                        | .000                        | .055                       |

\*\*\*AZIMUTH ANGLE = 125.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW |
|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|
| 0              | .002                         | -.310                       | .239                       | -.001                        | -.001                       | .096                       | 90.0           | -.101                        | -.023                       | .155                       | -.020                        | .000                        | .048                       |
| 5.0            | -.020                        | -.307                       | .236                       | .000                         | -.004                       | .095                       | 95.0           | -.105                        | .043                        | .159                       | -.019                        | .001                        | .047                       |
| 10.0           | -.020                        | -.308                       | .234                       | .000                         | -.001                       | .095                       | 100.0          | -.110                        | .091                        | .163                       | -.019                        | .000                        | .046                       |
| 15.0           | -.032                        | -.316                       | .230                       | -.003                        | -.001                       | .094                       | 105.0          | -.114                        | .143                        | .168                       | -.019                        | .000                        | .047                       |
| 20.0           | -.042                        | -.323                       | .226                       | -.005                        | .000                        | .093                       | 110.0          | -.117                        | .200                        | .174                       | -.019                        | .000                        | .048                       |
| 25.0           | -.051                        | -.266                       | .221                       | -.007                        | .000                        | .091                       | 115.0          | -.119                        | .252                        | .181                       | -.019                        | .000                        | .050                       |
| 30.0           | -.060                        | -.256                       | .215                       | -.009                        | .001                        | .088                       | 120.0          | -.119                        | .303                        | .189                       | -.017                        | .000                        | .053                       |
| 35.0           | -.067                        | -.246                       | .209                       | -.014                        | .000                        | .085                       | 125.0          | -.119                        | .345                        | .196                       | -.015                        | .002                        | .054                       |
| 40.0           | -.074                        | -.238                       | .201                       | -.018                        | -.001                       | .082                       | 130.0          | -.114                        | .384                        | .203                       | -.010                        | .003                        | .057                       |
| 45.0           | -.079                        | -.224                       | .193                       | -.022                        | .002                        | .079                       | 135.0          | -.109                        | .409                        | .209                       | -.017                        | .000                        | .057                       |
| 50.0           | -.084                        | -.210                       | .184                       | -.023                        | .000                        | .074                       | 140.0          | -.099                        | .432                        | .214                       | -.019                        | .002                        | .057                       |
| 55.0           | -.088                        | -.200                       | .175                       | -.025                        | -.003                       | .071                       | 145.0          | -.087                        | .456                        | .218                       | -.023                        | .001                        | .056                       |
| 60.0           | -.091                        | -.183                       | .168                       | -.025                        | .000                        | .067                       | 150.0          | -.074                        | .479                        | .220                       | -.027                        | .000                        | .054                       |
| 65.0           | -.093                        | -.166                       | .160                       | -.026                        | .000                        | .063                       | 155.0          | -.060                        | .500                        | .222                       | -.030                        | .002                        | .052                       |
| 70.0           | -.093                        | -.146                       | .155                       | -.025                        | .000                        | .059                       | 160.0          | -.047                        | .519                        | .222                       | -.032                        | .005                        | .053                       |
| 75.0           | -.095                        | -.091                       | .152                       | -.024                        | .001                        | .055                       | 165.0          | -.035                        | .532                        | .222                       | -.033                        | .005                        | .049                       |
| 80.0           | -.096                        | -.088                       | .152                       | -.023                        | .000                        | .052                       | 170.0          | -.023                        | .539                        | .219                       | -.034                        | .004                        | .048                       |
| 85.0           | -.098                        | -.057                       | .153                       | -.021                        | .000                        | .050                       | 175.0          | -.014                        | .545                        | .215                       | -.034                        | .000                        | .046                       |
| 90.0           | -.101                        | -.023                       | .155                       | -.020                        | .000                        | .048                       | 180.0          | -.007                        | .547                        | .210                       | -.034                        | .000                        | .046                       |

Table A-1 cont'd

\*\*\*\*AZIMUTH ANGLE = 130.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
|----------------|-----------------|----------------|-------------------------------|-----------------|----------------|---------------|----------------|-----------------|----------------|-------------------------------|-----------------|----------------|---------------|
| 0              | .001            | -.377          | .234                          | -.004           | -.002          | .091          | 90.0           | -.120           | -.026          | .151                          | -.024           | .000           | .052          |
| 5.0            | -.025           | -.364          | .230                          | -.003           | -.003          | .090          | 95.0           | -.124           | .053           | .155                          | -.024           | .000           | .051          |
| 10.0           | -.025           | -.373          | .229                          | -.004           | -.002          | .090          | 100.0          | -.129           | .113           | .159                          | -.025           | .000           | .051          |
| 15.0           | -.039           | -.383          | .225                          | -.007           | .000           | .089          | 105.0          | -.134           | .176           | .164                          | -.026           | .000           | .051          |
| 20.0           | -.051           | -.391          | .220                          | -.010           | -.001          | .088          | 110.0          | -.137           | .242           | .168                          | -.026           | .000           | .052          |
| 25.0           | -.061           | -.283          | .214                          | -.014           | .000           | .086          | 115.0          | -.139           | .306           | .176                          | -.024           | .000           | .052          |
| 30.0           | -.072           | -.273          | .208                          | -.015           | .000           | .083          | 120.0          | -.139           | .365           | .183                          | -.019           | .000           | .052          |
| 35.0           | -.081           | -.262          | .201                          | -.022           | .001           | .081          | 125.0          | -.138           | .409           | .190                          | -.012           | .003           | .050          |
| 40.0           | -.089           | -.249          | .193                          | -.027           | .000           | .078          | 130.0          | -.132           | .447           | .197                          | -.006           | .003           | .049          |
| 45.0           | -.096           | -.232          | .185                          | -.031           | .000           | .075          | 135.0          | -.125           | .475           | .202                          | -.009           | .000           | .046          |
| 50.0           | -.103           | -.216          | .176                          | -.031           | .000           | .071          | 140.0          | -.113           | .496           | .207                          | -.010           | .000           | .044          |
| 55.0           | -.107           | -.205          | .168                          | -.031           | -.003          | .068          | 145.0          | -.100           | .519           | .211                          | -.014           | .000           | .042          |
| 60.0           | -.111           | -.189          | .161                          | -.029           | .001           | .065          | 150.0          | -.085           | .542           | .212                          | -.019           | .001           | .040          |
| 65.0           | -.113           | -.172          | .155                          | -.028           | .000           | .062          | 155.0          | -.069           | .563           | .213                          | -.022           | .000           | .039          |
| 70.0           | -.113           | -.153          | .150                          | -.027           | .000           | .060          | 160.0          | -.053           | .583           | .213                          | -.024           | .005           | .042          |
| 75.0           | -.114           | -.110          | .148                          | -.025           | .001           | .057          | 165.0          | -.039           | .594           | .213                          | -.025           | .004           | .037          |
| 80.0           | -.115           | -.111          | .148                          | -.024           | -.001          | .055          | 170.0          | -.025           | .603           | .208                          | -.026           | .002           | .037          |
| 85.0           | -.117           | -.073          | .149                          | -.024           | .000           | .053          | 175.0          | -.015           | .610           | .202                          | -.026           | .001           | .037          |
| 90.0           | -.120           | -.026          | .151                          | -.024           | .000           | .052          | 180.0          | -.007           | .616           | .196                          | -.027           | .000           | .037          |

\*\*\*\*AZIMUTH ANGLE = 135.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
|----------------|-----------------|----------------|-------------------------------|-----------------|----------------|---------------|----------------|-----------------|----------------|-------------------------------|-----------------|----------------|---------------|
| 0              | .000            | -.445          | .230                          | -.008           | -.003          | .087          | 90.0           | -.139           | -.030          | .148                          | -.027           | .001           | .057          |
| 5.0            | -.030           | -.421          | .224                          | -.006           | -.003          | .086          | 95.0           | -.144           | .063           | .151                          | -.029           | .000           | .056          |
| 10.0           | -.030           | -.438          | .224                          | -.008           | -.003          | .086          | 100.0          | -.149           | .135           | .155                          | -.031           | .000           | .056          |
| 15.0           | -.047           | -.450          | .220                          | -.012           | .001           | .085          | 105.0          | -.154           | .210           | .160                          | -.033           | .001           | .056          |
| 20.0           | -.060           | -.459          | .214                          | -.016           | -.002          | .083          | 110.0          | -.158           | .285           | .163                          | -.033           | .001           | .056          |
| 25.0           | -.071           | -.300          | .208                          | -.021           | .001           | .081          | 115.0          | -.160           | .360           | .171                          | -.029           | .001           | .054          |
| 30.0           | -.084           | -.290          | .201                          | -.021           | .000           | .078          | 120.0          | -.159           | .427           | .178                          | -.021           | .002           | .051          |
| 35.0           | -.095           | -.279          | .194                          | -.031           | .003           | .077          | 125.0          | -.157           | .473           | .184                          | -.009           | .004           | .046          |
| 40.0           | -.105           | -.261          | .186                          | -.036           | .001           | .074          | 130.0          | -.150           | .511           | .191                          | -.002           | .003           | .041          |
| 45.0           | -.114           | -.241          | .177                          | -.040           | -.002          | .071          | 135.0          | -.141           | .541           | .196                          | .000            | .001           | .035          |
| 50.0           | -.122           | -.222          | .168                          | -.039           | .001           | .068          | 140.0          | -.127           | .560           | .201                          | -.001           | .002           | .031          |
| 55.0           | -.127           | -.210          | .155                          | -.037           | .003           | .066          | 145.0          | -.113           | .582           | .204                          | -.005           | .001           | .028          |
| 60.0           | -.131           | -.195          | .155                          | -.034           | .004           | .064          | 150.0          | -.096           | .605           | .205                          | -.011           | .002           | .026          |
| 65.0           | -.133           | -.179          | .150                          | -.031           | -.002          | .062          | 155.0          | -.079           | .626           | .205                          | -.014           | .001           | .026          |
| 70.0           | -.133           | -.160          | .146                          | -.029           | .001           | .061          | 160.0          | -.059           | .647           | .204                          | -.016           | .005           | .032          |
| 75.0           | -.133           | -.130          | .144                          | -.027           | .001           | .059          | 165.0          | -.043           | .656           | .204                          | -.017           | .003           | .026          |
| 80.0           | -.134           | -.135          | .144                          | -.026           | -.002          | .058          | 170.0          | -.028           | .668           | .197                          | -.019           | .001           | .026          |
| 85.0           | -.136           | -.090          | .145                          | -.027           | .000           | .057          | 175.0          | -.016           | .675           | .190                          | -.019           | .002           | .028          |
| 90.0           | -.139           | -.030          | .148                          | -.027           | .001           | .057          | 180.0          | -.008           | .685           | .182                          | -.020           | .001           | .029          |

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Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 140.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | SIDE | MOMENT COEFFICIENTS |       | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | SIDE | MOMENT COEFFICIENTS |       | YAW  |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL |      | PITCH               | ROLL  |      |                | NORMAL             | AXIAL |      | PITCH               | ROLL  |      |
| 0              | .000               | -.476 | .216 | -.006               | -.002 | .079 | 90.0           | -.150              | -.020 | .132 | -.028               | .000  | .045 |
| 5.0            | -.031              | -.453 | .214 | -.005               | -.002 | .079 | 95.0           | -.155              | .058  | .135 | -.029               | .000  | .044 |
| 10.0           | -.040              | -.448 | .213 | -.007               | -.001 | .079 | 100.0          | -.160              | .130  | .140 | -.030               | .000  | .044 |
| 15.0           | -.060              | -.436 | .210 | -.010               | .001  | .078 | 105.0          | -.165              | .205  | .145 | -.031               | .001  | .044 |
| 20.0           | -.075              | -.423 | .205 | -.014               | -.001 | .077 | 110.0          | -.170              | .277  | .150 | -.032               | -.001 | .044 |
| 25.0           | -.089              | -.301 | .199 | -.018               | .000  | .076 | 115.0          | -.174              | .352  | .151 | -.029               | .001  | .043 |
| 30.0           | -.102              | -.284 | .192 | -.020               | .000  | .074 | 120.0          | -.173              | .420  | .164 | -.023               | -.001 | .040 |
| 35.0           | -.113              | -.268 | .185 | -.029               | .001  | .073 | 125.0          | -.170              | .470  | .168 | -.014               | .003  | .036 |
| 40.0           | -.122              | -.249 | .175 | -.034               | .000  | .070 | 130.0          | -.162              | .513  | .174 | -.008               | .002  | .031 |
| 45.0           | -.131              | -.232 | .166 | -.038               | .001  | .066 | 135.0          | -.150              | .549  | .177 | -.007               | .000  | .025 |
| 50.0           | -.138              | -.214 | .157 | -.037               | -.001 | .062 | 140.0          | -.134              | .577  | .180 | -.005               | .001  | .021 |
| 55.0           | -.141              | -.203 | .149 | -.035               | -.001 | .058 | 145.0          | -.119              | .604  | .182 | -.007               | .000  | .018 |
| 60.0           | -.143              | -.190 | .141 | -.031               | .003  | .055 | 150.0          | -.101              | .629  | .182 | -.010               | .001  | .017 |
| 65.0           | -.143              | -.176 | .134 | -.029               | -.002 | .052 | 155.0          | -.083              | .650  | .181 | -.012               | -.001 | .017 |
| 70.0           | -.142              | -.157 | .130 | -.028               | .000  | .050 | 160.0          | -.062              | .672  | .179 | -.014               | .004  | .021 |
| 75.0           | -.142              | -.128 | .127 | -.028               | .000  | .048 | 165.0          | -.045              | .683  | .177 | -.015               | .002  | .018 |
| 80.0           | -.143              | -.122 | .127 | -.028               | .000  | .046 | 170.0          | -.029              | .696  | .170 | -.018               | .000  | .018 |
| 85.0           | -.146              | -.079 | .129 | -.028               | .000  | .045 | 175.0          | -.016              | .702  | .163 | -.021               | .001  | .019 |
| 90.0           | -.150              | -.020 | .132 | -.028               | .000  | .045 | 180.0          | -.006              | .710  | .155 | -.023               | .001  | .020 |

\*\*\*AZIMUTH ANGLE = 145.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | SIDE | MOMENT COEFFICIENTS |       | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | SIDE | MOMENT COEFFICIENTS |       | PITCH | MOMENT COEFFICIENTS |       | ROLL  | YAW  |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|-------|---------------------|-------|-------|------|
|                | NORMAL             | AXIAL |      | PITCH               | ROLL  |      |                | NORMAL             | AXIAL |      | PITCH               | ROLL  |       |                     |       |       |      |
| 0              | -.001              | -.508 | .202 | -.005               | -.001 | .072 | 90.0           | -.161              | -.010 | .116 | -.029               | .000  | -.029 | .000                | -.029 | .000  | .033 |
| 5.0            | -.033              | -.486 | .204 | -.005               | -.001 | .072 | 95.0           | -.166              | .054  | .119 | -.029               | .000  | -.029 | .000                | -.029 | .000  | .032 |
| 10.0           | -.051              | -.458 | .203 | -.006               | .000  | .072 | 100.0          | -.171              | .125  | .125 | -.029               | .000  | -.029 | .000                | -.029 | .000  | .032 |
| 15.0           | -.073              | -.423 | .200 | -.008               | .001  | .071 | 105.0          | -.176              | .200  | .131 | -.030               | .001  | -.030 | .001                | -.030 | .001  | .033 |
| 20.0           | -.091              | -.387 | .196 | -.012               | .000  | .071 | 110.0          | -.182              | .269  | .137 | -.031               | -.001 | -.031 | -.001               | -.031 | -.001 | .033 |
| 25.0           | -.107              | -.303 | .190 | -.016               | .000  | .071 | 115.0          | -.188              | .345  | .132 | -.030               | .001  | -.030 | .001                | -.030 | .001  | .032 |
| 30.0           | -.120              | -.278 | .183 | -.019               | .000  | .070 | 120.0          | -.188              | .413  | .150 | -.026               | .000  | -.026 | .000                | -.026 | .000  | .029 |
| 35.0           | -.131              | -.258 | .176 | -.027               | .000  | .069 | 125.0          | -.183              | .467  | .153 | -.020               | .003  | -.020 | .003                | -.020 | .003  | .026 |
| 40.0           | -.140              | -.237 | .165 | -.032               | .000  | .066 | 130.0          | -.174              | .515  | .157 | -.014               | .002  | -.014 | .002                | -.014 | .002  | .021 |
| 45.0           | -.148              | -.223 | .155 | -.036               | .000  | .061 | 135.0          | -.159              | .557  | .158 | -.012               | .001  | -.012 | .001                | -.012 | .001  | .015 |
| 50.0           | -.155              | -.207 | .146 | -.035               | -.002 | .056 | 140.0          | -.142              | .594  | .160 | -.009               | .001  | -.009 | .001                | -.009 | .001  | .011 |
| 55.0           | -.155              | -.196 | .137 | -.033               | .000  | .051 | 145.0          | -.125              | .626  | .160 | -.009               | .000  | -.009 | .000                | -.009 | .000  | .008 |
| 60.0           | -.155              | -.185 | .128 | -.029               | .002  | .047 | 150.0          | -.106              | .653  | .159 | -.010               | .001  | -.010 | .001                | -.010 | .001  | .008 |
| 65.0           | -.154              | -.173 | .118 | -.028               | -.002 | .043 | 155.0          | -.087              | .675  | .157 | -.011               | -.001 | -.011 | -.001               | -.011 | -.001 | .008 |
| 70.0           | -.152              | -.154 | .114 | -.027               | -.002 | .039 | 160.0          | -.066              | .697  | .154 | -.012               | .003  | -.012 | .003                | -.012 | .003  | .011 |
| 75.0           | -.151              | -.126 | .111 | -.030               | .000  | .037 | 165.0          | -.047              | .710  | .150 | -.014               | .001  | -.014 | .001                | -.014 | .001  | .010 |
| 80.0           | -.153              | -.110 | .111 | -.030               | .002  | .035 | 170.0          | -.030              | .724  | .144 | -.017               | .000  | -.017 | .000                | -.017 | .000  | .010 |
| 85.0           | -.156              | -.069 | .113 | -.029               | -.001 | .033 | 175.0          | -.016              | .730  | .137 | -.024               | .000  | -.024 | .000                | -.024 | .000  | .011 |
| 90.0           | -.161              | -.010 | .116 | -.029               | .000  | .033 | 180.0          | -.005              | .735  | .128 | -.026               | .001  | -.026 | .001                | -.026 | .001  | .011 |

Table A-1 cont'd

| ***AZIMUTH ANGLE = 150.0*** |                    |       |                     |       |                |                    |       |                     |       |                     |       |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0                           | -.002              | -.540 | .188                | -.004 | 90.0           | -.172              | .000  | .100                | -.030 | -.001               | .021  |
| 5.0                         | -.035              | -.519 | .195                | -.005 | 95.0           | -.178              | .050  | .103                | -.029 | .001                | .020  |
| 10.0                        | -.062              | -.469 | .193                | -.006 | 100.0          | -.183              | .120  | .111                | -.028 | .001                | .020  |
| 15.0                        | -.086              | -.410 | .190                | -.007 | 105.0          | -.188              | .195  | .117                | -.029 | .002                | .022  |
| 20.0                        | -.107              | -.351 | .187                | -.010 | 110.0          | -.195              | .262  | .124                | -.030 | -.002               | .022  |
| 25.0                        | -.126              | -.305 | .182                | -.014 | 115.0          | -.202              | .338  | .113                | -.031 | .002                | .021  |
| 30.0                        | -.139              | -.273 | .175                | -.019 | 120.0          | -.203              | .407  | .136                | -.029 | .001                | .019  |
| 35.0                        | -.149              | -.248 | .167                | -.025 | 125.0          | -.197              | .464  | .138                | -.026 | .003                | .017  |
| 40.0                        | -.158              | -.225 | .155                | -.031 | 130.0          | -.186              | .518  | .140                | -.020 | .002                | .012  |
| 45.0                        | -.166              | -.214 | .145                | -.034 | 135.0          | -.168              | .565  | .140                | -.017 | .002                | .005  |
| 50.0                        | -.172              | -.200 | .135                | -.034 | 140.0          | -.150              | .612  | .140                | -.013 | .001                | .001  |
| 55.0                        | -.170              | -.190 | .125                | -.031 | 145.0          | -.131              | .648  | .139                | -.011 | .000                | -.001 |
| 60.0                        | -.168              | -.180 | .115                | -.027 | 150.0          | -.111              | .677  | .137                | -.010 | .001                | -.001 |
| 65.0                        | -.165              | -.170 | .103                | -.027 | 155.0          | -.091              | .700  | .134                | -.010 | -.002               | .000  |
| 70.0                        | -.162              | -.152 | .098                | -.027 | 160.0          | -.070              | .722  | .129                | -.011 | .002                | .001  |
| 75.0                        | -.161              | -.125 | .095                | -.032 | 165.0          | -.049              | .738  | .124                | -.013 | .000                | .002  |
| 80.0                        | -.163              | -.098 | .095                | -.032 | 170.0          | -.032              | .753  | .118                | -.017 | .000                | .002  |
| 85.0                        | -.167              | -.059 | .097                | -.031 | 175.0          | -.016              | .758  | .111                | -.027 | .000                | .003  |
| 90.0                        | -.172              | -.000 | .100                | -.030 | 180.0          | -.004              | .760  | .102                | -.029 | .002                | .003  |
| ***AZIMUTH ANGLE = 155.0*** |                    |       |                     |       |                |                    |       |                     |       |                     |       |
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0                           | .000               | -.567 | .146                | -.000 | 90.0           | -.187              | -.023 | .087                | -.043 | -.001               | .025  |
| 5.0                         | -.026              | -.553 | .152                | -.002 | 95.0           | -.190              | .053  | .089                | -.042 | .000                | .024  |
| 10.0                        | -.058              | -.516 | .149                | -.005 | 100.0          | -.193              | .138  | .095                | -.041 | .001                | .024  |
| 15.0                        | -.082              | -.471 | .147                | -.007 | 105.0          | -.197              | .217  | .099                | -.041 | .001                | .026  |
| 20.0                        | -.103              | -.425 | .145                | -.011 | 110.0          | -.204              | .289  | .104                | -.040 | -.002               | .024  |
| 25.0                        | -.120              | -.383 | .141                | -.016 | 115.0          | -.210              | .367  | .097                | -.039 | .002                | .023  |
| 30.0                        | -.133              | -.352 | .137                | -.021 | 120.0          | -.212              | .439  | .112                | -.035 | .001                | .023  |
| 35.0                        | -.143              | -.322 | .131                | -.027 | 125.0          | -.205              | .494  | .114                | -.031 | .002                | .017  |
| 40.0                        | -.150              | -.293 | .123                | -.032 | 130.0          | -.193              | .545  | .116                | -.025 | .001                | .012  |
| 45.0                        | -.161              | -.273 | .116                | -.036 | 135.0          | -.175              | .594  | .116                | -.022 | .000                | .005  |
| 50.0                        | -.175              | -.249 | .110                | -.038 | 140.0          | -.154              | .639  | .116                | -.017 | .000                | .000  |
| 55.0                        | -.174              | -.225 | .103                | -.038 | 145.0          | -.133              | .677  | .115                | -.015 | .000                | .000  |
| 60.0                        | -.177              | -.206 | .097                | -.037 | 150.0          | -.111              | .704  | .112                | -.014 | .000                | -.001 |
| 65.0                        | -.179              | -.190 | .089                | -.039 | 155.0          | -.088              | .726  | .105                | -.014 | -.002               | -.001 |
| 70.0                        | -.180              | -.167 | .085                | -.040 | 160.0          | -.067              | .744  | .097                | -.015 | .001                | .000  |
| 75.0                        | -.181              | -.137 | .083                | -.044 | 165.0          | -.047              | .759  | .091                | -.017 | .000                | .001  |
| 80.0                        | -.183              | -.108 | .083                | -.044 | 170.0          | -.030              | .769  | .084                | -.021 | .000                | .001  |
| 85.0                        | -.185              | -.065 | .085                | -.044 | 175.0          | -.014              | .773  | .078                | -.029 | .000                | .002  |
| 90.0                        | -.187              | -.023 | .087                | -.043 | 180.0          | -.002              | .776  | .071                | -.031 | .001                | .002  |

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Table A-1 cont'd

\*\*\*AZIMUTH ANGLE = 160.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0              | .000               | -.594 | .104                | .043 | 90.0           | -.202              | -.046 | .074                | -.056 | -.001               | .029  |
| 5.0            | -.018              | -.588 | .109                | .043 | 95.0           | -.202              | .057  | .076                | -.055 | -.001               | .028  |
| 10.0           | -.054              | -.563 | .106                | .043 | 100.0          | -.204              | .156  | .079                | -.054 | .000                | .030  |
| 15.0           | -.079              | -.533 | .104                | .043 | 105.0          | -.206              | .239  | .081                | -.053 | .000                | .026  |
| 20.0           | -.100              | -.500 | .103                | .044 | 110.0          | -.213              | .316  | .084                | -.050 | -.002               | .025  |
| 25.0           | -.115              | -.461 | .101                | .044 | 115.0          | -.219              | .346  | .081                | -.047 | .001                | .027  |
| 30.0           | -.127              | -.432 | .099                | .044 | 120.0          | -.221              | .472  | .089                | -.042 | .001                | .027  |
| 35.0           | -.137              | -.396 | .096                | .044 | 125.0          | -.213              | .525  | .090                | -.036 | .002                | .018  |
| 40.0           | -.142              | -.362 | .091                | .043 | 130.0          | -.201              | .572  | .092                | -.030 | .001                | .012  |
| 45.0           | -.156              | -.332 | .088                | .041 | 135.0          | -.182              | .623  | .092                | -.027 | .000                | .005  |
| 50.0           | -.179              | -.298 | .085                | .039 | 140.0          | -.159              | .666  | .092                | -.021 | .000                | .000  |
| 55.0           | -.178              | -.260 | .081                | .037 | 145.0          | -.135              | .706  | .091                | -.019 | .000                | -.002 |
| 60.0           | -.186              | -.233 | .079                | .035 | 150.0          | -.111              | .731  | .087                | -.018 | .000                | -.002 |
| 65.0           | -.194              | -.210 | .075                | .034 | 155.0          | -.086              | .752  | .076                | -.019 | .000                | -.001 |
| 70.0           | -.198              | -.183 | .073                | .032 | 160.0          | -.064              | .766  | .066                | -.021 | .000                | .000  |
| 75.0           | -.201              | -.149 | .072                | .031 | 165.0          | -.045              | .781  | .059                | -.025 | .000                | .000  |
| 80.0           | -.203              | -.118 | .072                | .030 | 170.0          | -.028              | .785  | .050                | -.031 | -.001               | .001  |
| 85.0           | -.203              | -.072 | .073                | .029 | 175.0          | -.012              | .788  | .045                | -.033 | -.001               | .001  |
| 90.0           | -.202              | -.046 | .074                | .029 | 180.0          | -.001              | .792  | .040                | -.033 | .001                | .001  |

\*\*\*AZIMUTH ANGLE = 165.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0              | .002               | -.021 | .062                | .032 | 90.0           | -.218              | -.070 | .062                | -.069 | -.002               | .033  |
| 5.0            | -.010              | -.623 | .066                | .032 | 95.0           | -.215              | .061  | .063                | -.069 | -.003               | .032  |
| 10.0           | -.050              | -.610 | .063                | .033 | 100.0          | -.215              | .175  | .063                | -.067 | .001                | .033  |
| 15.0           | -.076              | -.595 | .062                | .033 | 105.0          | -.216              | .262  | .064                | -.065 | -.001               | .035  |
| 20.0           | -.097              | -.575 | .061                | .033 | 110.0          | -.222              | .344  | .065                | -.061 | -.003               | .029  |
| 25.0           | -.110              | -.540 | .061                | .033 | 115.0          | -.228              | .426  | .065                | -.056 | .002                | .027  |
| 30.0           | -.121              | -.512 | .061                | .034 | 120.0          | -.230              | .505  | .066                | -.049 | .002                | .032  |
| 35.0           | -.132              | -.471 | .061                | .034 | 125.0          | -.222              | .556  | .067                | -.042 | .002                | .019  |
| 40.0           | -.134              | -.431 | .060                | .034 | 130.0          | -.209              | .600  | .068                | -.036 | .001                | .012  |
| 45.0           | -.152              | -.391 | .060                | .034 | 135.0          | -.190              | .633  | .069                | -.031 | .002                | .005  |
| 50.0           | -.183              | -.348 | .060                | .034 | 140.0          | -.164              | .693  | .068                | -.026 | -.002               | .000  |
| 55.0           | -.182              | -.295 | .060                | .034 | 145.0          | -.137              | .735  | .067                | -.023 | .001                | -.003 |
| 60.0           | -.196              | -.260 | .061                | .034 | 150.0          | -.111              | .758  | .062                | -.022 | -.001               | -.003 |
| 65.0           | -.209              | -.230 | .061                | .034 | 155.0          | -.084              | .778  | .048                | -.022 | -.003               | -.003 |
| 70.0           | -.216              | -.199 | .061                | .034 | 160.0          | -.062              | .789  | .035                | -.024 | -.001               | -.002 |
| 75.0           | -.222              | -.162 | .061                | .034 | 165.0          | -.044              | .803  | .027                | -.026 | .000                | .000  |
| 80.0           | -.224              | -.128 | .061                | .034 | 170.0          | -.026              | .802  | .016                | -.029 | -.002               | .000  |
| 85.0           | -.221              | -.079 | .062                | .033 | 175.0          | -.010              | .803  | .012                | -.033 | -.002               | .001  |
| 90.0           | -.218              | -.070 | .062                | .033 | 180.0          | .000               | .809  | .010                | -.036 | .001                | .001  |



Table A-1 cont'd

| ***AZIMUTH ANGLE = 170.0*** |                 |                             |                            |                              |                             |                            |                |                 |                             |                            |
|-----------------------------|-----------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------|-----------------|-----------------------------|----------------------------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE |
| 0                           | .001            | -.701                       | .041                       | .020                         | .001                        | .021                       | 90.0           | -.211           | -.063                       | .040                       |
| 5.0                         | -.018           | -.698                       | .043                       | .015                         | .000                        | .022                       | 95.0           | -.211           | .054                        | .041                       |
| 10.0                        | -.057           | -.688                       | .041                       | .007                         | -.004                       | .022                       | 100.0          | -.213           | .148                        | .041                       |
| 15.0                        | -.084           | -.670                       | .041                       | .001                         | -.002                       | .022                       | 105.0          | -.217           | .241                        | .042                       |
| 20.0                        | -.106           | -.645                       | .040                       | -.006                        | -.002                       | .022                       | 110.0          | -.224           | .333                        | .043                       |
| 25.0                        | -.125           | -.607                       | .040                       | -.014                        | -.002                       | .022                       | 115.0          | -.230           | .423                        | .043                       |
| 30.0                        | -.138           | -.574                       | .040                       | -.023                        | -.002                       | .023                       | 120.0          | -.229           | .495                        | .044                       |
| 35.0                        | -.152           | -.530                       | .040                       | -.034                        | .001                        | .022                       | 125.0          | -.216           | .542                        | .045                       |
| 40.0                        | -.158           | -.480                       | .040                       | -.042                        | .002                        | .022                       | 130.0          | -.201           | .583                        | .046                       |
| 45.0                        | -.173           | -.430                       | .040                       | -.049                        | -.002                       | .022                       | 135.0          | -.181           | .632                        | .047                       |
| 50.0                        | -.194           | -.378                       | .040                       | -.054                        | .000                        | .023                       | 140.0          | -.156           | .679                        | .046                       |
| 55.0                        | -.192           | -.320                       | .039                       | -.059                        | .001                        | .023                       | 145.0          | -.130           | .724                        | .045                       |
| 60.0                        | -.205           | -.280                       | .040                       | -.063                        | .000                        | .023                       | 150.0          | -.105           | .756                        | .041                       |
| 65.0                        | -.205           | -.244                       | .040                       | -.065                        | .000                        | .022                       | 155.0          | -.079           | .781                        | .031                       |
| 70.0                        | -.206           | -.211                       | .040                       | -.067                        | .001                        | .022                       | 160.0          | -.058           | .797                        | .023                       |
| 75.0                        | -.209           | -.172                       | .040                       | -.068                        | -.001                       | .022                       | 165.0          | -.040           | .811                        | .017                       |
| 80.0                        | -.211           | -.136                       | .040                       | -.068                        | .000                        | .022                       | 170.0          | -.023           | .811                        | .010                       |
| 85.0                        | -.211           | -.086                       | .040                       | -.068                        | -.001                       | .021                       | 175.0          | -.008           | .812                        | .007                       |
| 90.0                        | -.211           | -.063                       | .040                       | -.066                        | -.002                       | .021                       | 180.0          | .000            | .819                        | .006                       |
| ***AZIMUTH ANGLE = 175.0*** |                 |                             |                            |                              |                             |                            |                |                 |                             |                            |
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE |
| 0                           | .000            | -.781                       | .020                       | .030                         | .000                        | .011                       | 90.0           | -.204           | -.056                       | .019                       |
| 5.0                         | -.027           | -.774                       | .021                       | .026                         | .000                        | .012                       | 95.0           | -.207           | .048                        | .019                       |
| 10.0                        | -.064           | -.766                       | .020                       | .019                         | -.003                       | .012                       | 100.0          | -.212           | .121                        | .019                       |
| 15.0                        | -.093           | -.746                       | .020                       | .012                         | -.001                       | .012                       | 105.0          | -.218           | .220                        | .020                       |
| 20.0                        | -.115           | -.715                       | .019                       | .002                         | -.001                       | .012                       | 110.0          | -.226           | .323                        | .021                       |
| 25.0                        | -.140           | -.674                       | .019                       | -.007                        | .002                        | .012                       | 115.0          | -.232           | .420                        | .022                       |
| 30.0                        | -.156           | -.637                       | .019                       | -.021                        | .001                        | .012                       | 120.0          | -.228           | .485                        | .023                       |
| 35.0                        | -.172           | -.589                       | .019                       | -.037                        | .001                        | .011                       | 125.0          | -.211           | .528                        | .023                       |
| 40.0                        | -.183           | -.529                       | .020                       | -.048                        | .002                        | .010                       | 130.0          | -.193           | .567                        | .024                       |
| 45.0                        | -.195           | -.469                       | .020                       | -.057                        | -.002                       | .011                       | 135.0          | -.173           | .611                        | .025                       |
| 50.0                        | -.205           | -.408                       | .020                       | -.062                        | .001                        | .012                       | 140.0          | -.149           | .665                        | .024                       |
| 55.0                        | -.203           | -.346                       | .019                       | -.065                        | .001                        | .012                       | 145.0          | -.123           | .713                        | .023                       |
| 60.0                        | -.203           | -.300                       | .019                       | -.067                        | .000                        | .012                       | 150.0          | -.099           | .754                        | .020                       |
| 65.0                        | -.201           | -.258                       | .019                       | -.067                        | .000                        | .011                       | 155.0          | -.075           | .784                        | .015                       |
| 70.0                        | -.196           | -.223                       | .019                       | -.068                        | .002                        | .010                       | 160.0          | -.054           | .805                        | .011                       |
| 75.0                        | -.196           | -.182                       | .019                       | -.067                        | -.001                       | .010                       | 165.0          | -.036           | .819                        | .007                       |
| 80.0                        | -.198           | -.144                       | .019                       | -.066                        | -.001                       | .010                       | 170.0          | -.020           | .821                        | .004                       |
| 85.0                        | -.201           | -.093                       | .019                       | -.067                        | -.001                       | .010                       | 175.0          | -.006           | .821                        | .002                       |
| 90.0                        | -.204           | -.056                       | .019                       | -.064                        | -.002                       | .010                       | 180.0          | .000            | .830                        | .002                       |

Table A-1 cont'd

| ***AZIMUTH ANGLE = 180.0*** |                    |       |                     |       |                |       |                    |       |                     |       |                |       |       |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|-------|--------------------|-------|---------------------|-------|----------------|-------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |       | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |       | YAW   |
|                             | NORMAL             | AXIAL | PITCH               | ROLL  |                |       | NORMAL             | AXIAL | PITCH               | ROLL  |                |       |       |
| 0                           | .000               | -.862 | -.041               | -.001 | 90.0           | -.197 | -.050              | -.062 | -.002               | -.001 | 90.0           | -.197 | -.001 |
| 5.0                         | -.036              | -.850 | -.038               | -.001 | 95.0           | -.203 | .042               | -.065 | -.001               | -.001 | 95.0           | -.203 | -.001 |
| 10.0                        | -.071              | -.845 | -.031               | -.003 | 100.0          | -.211 | .095               | -.064 | -.002               | -.002 | 100.0          | -.211 | -.002 |
| 15.0                        | -.102              | -.822 | -.023               | .000  | 105.0          | -.220 | .200               | -.063 | -.002               | .000  | 105.0          | -.220 | .000  |
| 20.0                        | -.124              | -.785 | -.011               | .000  | 110.0          | -.229 | .313               | -.058 | -.001               | .000  | 110.0          | -.229 | .000  |
| 25.0                        | -.155              | -.742 | -.001               | .002  | 115.0          | -.234 | .418               | -.052 | .001                | .000  | 115.0          | -.234 | .001  |
| 30.0                        | -.174              | -.700 | -.019               | -.001 | 120.0          | -.228 | .475               | -.045 | .002                | .000  | 120.0          | -.228 | .002  |
| 35.0                        | -.192              | -.648 | -.040               | .001  | 125.0          | -.206 | .515               | -.036 | .002                | .000  | 125.0          | -.206 | .002  |
| 40.0                        | -.208              | -.579 | -.055               | .002  | 130.0          | -.186 | .551               | -.028 | .003                | .000  | 130.0          | -.186 | .003  |
| 45.0                        | -.217              | -.508 | -.065               | -.003 | 135.0          | -.165 | .591               | -.024 | .001                | .000  | 135.0          | -.165 | .001  |
| 50.0                        | -.217              | -.438 | -.070               | .002  | 140.0          | -.142 | .651               | -.025 | .002                | .001  | 140.0          | -.142 | .002  |
| 55.0                        | -.214              | -.372 | -.071               | .001  | 145.0          | -.117 | .703               | -.030 | .001                | .001  | 145.0          | -.117 | .001  |
| 60.0                        | -.207              | -.320 | -.071               | .000  | 150.0          | -.094 | .752               | -.031 | .000                | .002  | 150.0          | -.094 | .000  |
| 65.0                        | -.197              | -.272 | -.070               | .001  | 155.0          | -.071 | .788               | -.032 | .001                | .002  | 155.0          | -.071 | .001  |
| 70.0                        | -.187              | -.235 | -.069               | .003  | 160.0          | -.051 | .813               | -.032 | .001                | .001  | 160.0          | -.051 | .001  |
| 75.0                        | -.184              | -.193 | -.067               | -.002 | 165.0          | -.032 | .827               | -.030 | .002                | .001  | 165.0          | -.032 | .002  |
| 80.0                        | -.186              | -.153 | -.065               | -.002 | 170.0          | -.017 | .831               | -.028 | .002                | .001  | 170.0          | -.017 | .002  |
| 85.0                        | -.191              | -.100 | -.066               | -.002 | 175.0          | -.005 | .831               | -.024 | .003                | .001  | 175.0          | -.005 | .003  |
| 90.0                        | -.197              | -.050 | -.062               | -.002 | 180.0          | .001  | .841               | -.019 | .001                | .001  | 180.0          | .001  | .001  |

Table A-2. Wind load coefficients for paraboloid,  $F/D = 0.424$ ,  $H/D = 0.147$ , porosity 0%

| ***AZIMUTH ANGLE = 0.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
|---------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|------|------|
| ELEV.<br>ANGLE            | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      | YAW  |
|                           | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL |      |
| 0                         | -.032              | 1.521 | -.002               | -.002 | 90.0           | .153               | .000  | -.007               | .001 | .104                | .001 | .000 |
| 5.0                       | -.037              | 1.521 | -.001               | .000  | 95.0           | .154               | -.191 | -.006               | .001 | .109                | .001 | .000 |
| 10.0                      | -.038              | 1.531 | .000                | .001  | 100.0          | .158               | -.381 | -.005               | .001 | .111                | .001 | .000 |
| 15.0                      | -.039              | 1.501 | .001                | -.002 | 105.0          | .161               | -.502 | .000                | .001 | .110                | .001 | .000 |
| 20.0                      | -.042              | 1.481 | .001                | .002  | 110.0          | .172               | -.600 | -.002               | .001 | .110                | .001 | .000 |
| 25.0                      | -.044              | 1.411 | .001                | -.002 | 115.0          | .192               | -.753 | -.001               | .000 | .120                | .000 | .000 |
| 30.0                      | -.058              | 1.461 | .001                | .001  | 120.0          | .216               | -.600 | .000                | .001 | .124                | .000 | .001 |
| 35.0                      | -.068              | 1.471 | .001                | -.001 | 125.0          | .220               | -.486 | .001                | .001 | .125                | .000 | .001 |
| 40.0                      | -.081              | 1.501 | .000                | .002  | 130.0          | .212               | -.512 | .002                | .001 | .124                | .001 | .001 |
| 45.0                      | -.110              | 1.602 | -.003               | .002  | 135.0          | .201               | -.532 | .004                | .001 | .112                | .001 | .001 |
| 50.0                      | -.135              | 1.806 | -.005               | .002  | 140.0          | .189               | -.614 | .004                | .001 | .095                | .001 | .001 |
| 55.0                      | -.124              | 1.986 | -.009               | .002  | 145.0          | .171               | -.712 | .004                | .001 | .070                | .001 | .001 |
| 60.0                      | -.078              | 1.832 | -.011               | .002  | 150.0          | .151               | -.793 | .004                | .001 | .050                | .001 | .002 |
| 65.0                      | .005               | 1.601 | .001                | .000  | 155.0          | .130               | -.834 | .003                | .000 | .040                | .001 | .002 |
| 70.0                      | .080               | 1.251 | .011                | .001  | 160.0          | .100               | -.882 | .003                | .000 | .032                | .000 | .002 |
| 75.0                      | .122               | .981  | .010                | .001  | 165.0          | .070               | -.880 | .003                | .000 | .028                | .000 | .002 |
| 80.0                      | .141               | .501  | .009                | .001  | 170.0          | .039               | -.954 | .002                | .001 | .024                | .001 | .002 |
| 85.0                      | .145               | .302  | -.008               | .001  | 175.0          | .008               | -.962 | .002                | .001 | .024                | .001 | .002 |
| 90.0                      | .153               | .000  | -.007               | .001  | 180.0          | -.030              | -.961 | .002                | .001 | .022                | .001 | .002 |
| ***AZIMUTH ANGLE = 5.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
| ELEV.<br>ANGLE            | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      | YAW  |
|                           | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL |      |
| 0                         | -.032              | 1.522 | -.008               | -.003 | 90.0           | .142               | .047  | .006                | .003 | .110                | .003 | .015 |
| 5.0                       | -.035              | 1.509 | -.007               | .001  | 95.0           | .143               | -.162 | .009                | .003 | .113                | .003 | .016 |
| 10.0                      | -.036              | 1.515 | -.007               | .000  | 100.0          | .146               | -.351 | .011                | .003 | .114                | .003 | .017 |
| 15.0                      | -.037              | 1.495 | -.006               | .000  | 105.0          | .149               | -.486 | .014                | .003 | .113                | .003 | .018 |
| 20.0                      | -.040              | 1.482 | -.006               | .000  | 110.0          | .159               | -.600 | .016                | .004 | .112                | .004 | .018 |
| 25.0                      | -.043              | 1.435 | -.007               | .000  | 115.0          | .175               | -.739 | .018                | .003 | .118                | .003 | .018 |
| 30.0                      | -.054              | 1.472 | -.008               | .001  | 120.0          | .195               | -.655 | .020                | .003 | .119                | .003 | .019 |
| 35.0                      | -.063              | 1.485 | -.009               | .001  | 125.0          | .198               | -.568 | .022                | .003 | .117                | .003 | .019 |
| 40.0                      | -.074              | 1.515 | -.011               | .002  | 130.0          | .192               | -.572 | .023                | .002 | .114                | .002 | .019 |
| 45.0                      | -.095              | 1.592 | -.013               | .003  | 135.0          | .184               | -.576 | .026                | .003 | .103                | .003 | .019 |
| 50.0                      | -.110              | 1.728 | -.014               | .003  | 140.0          | .174               | -.637 | .026                | .003 | .087                | .003 | .020 |
| 55.0                      | -.097              | 1.845 | -.013               | .003  | 145.0          | .160               | -.712 | .027                | .003 | .066                | .003 | .020 |
| 60.0                      | -.052              | 1.712 | -.013               | .003  | 150.0          | .145               | -.780 | .027                | .002 | .049                | .002 | .021 |
| 65.0                      | .020               | 1.511 | -.009               | .003  | 155.0          | .128               | -.819 | .026                | .002 | .037                | .002 | .021 |
| 70.0                      | .082               | 1.221 | -.007               | .003  | 160.0          | .104               | -.879 | .028                | .003 | .027                | .003 | .021 |
| 75.0                      | .117               | .981  | -.002               | .003  | 165.0          | .078               | -.877 | .028                | .003 | .020                | .003 | .021 |
| 80.0                      | .133               | .561  | .001                | .003  | 170.0          | .051               | -.936 | .027                | .003 | .012                | .003 | .021 |
| 85.0                      | .137               | .342  | .004                | .003  | 175.0          | .019               | -.951 | .028                | .003 | .007                | .003 | .020 |
| 90.0                      | .142               | .047  | .006                | .003  | 180.0          | -.026              | -.954 | .028                | .003 | .002                | .003 | .021 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 10.0**** |                 |                |               |                 |                |               |                |                 |                |               |                 |                |               |
|-----------------------------|-----------------|----------------|---------------|-----------------|----------------|---------------|----------------|-----------------|----------------|---------------|-----------------|----------------|---------------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
| 0                           | -.032           | 1.523          | -.015         | .058            | -.004          | -.015         | 90.0           | .132            | .094           | .020          | .116            | .006           | .031          |
| 5.0                         | -.033           | 1.497          | -.014         | .060            | -.003          | -.015         | 95.0           | .132            | -.134          | .024          | .117            | .006           | .033          |
| 10.0                        | -.034           | 1.500          | -.014         | .058            | -.002          | -.014         | 100.0          | .134            | -.322          | .028          | .117            | .006           | .034          |
| 15.0                        | -.035           | 1.490          | -.014         | .056            | -.001          | -.014         | 105.0          | .137            | -.470          | .033          | .116            | .006           | .036          |
| 20.0                        | -.038           | 1.483          | -.014         | .051            | .000           | -.015         | 110.0          | .146            | -.601          | .035          | .115            | .007           | .036          |
| 25.0                        | -.042           | 1.460          | -.015         | .045            | .000           | -.016         | 115.0          | .159            | -.725          | .038          | .117            | .006           | .036          |
| 30.0                        | -.050           | 1.483          | -.017         | .038            | .001           | -.017         | 120.0          | .174            | -.711          | .041          | .115            | .006           | .037          |
| 35.0                        | -.058           | 1.500          | -.019         | .026            | .001           | -.017         | 125.0          | .176            | -.650          | .043          | .110            | .006           | .038          |
| 40.0                        | -.068           | 1.530          | -.022         | .012            | .002           | -.017         | 130.0          | .172            | -.632          | .045          | .104            | .006           | .037          |
| 45.0                        | -.080           | 1.583          | -.023         | .042            | .004           | -.013         | 135.0          | .167            | -.621          | .048          | .094            | .007           | .038          |
| 50.0                        | -.085           | 1.651          | -.022         | .059            | .004           | -.008         | 140.0          | .159            | -.661          | .049          | .080            | .007           | .039          |
| 55.0                        | -.070           | 1.704          | -.019         | .048            | .004           | .000          | 145.0          | .150            | -.712          | .050          | .063            | .007           | .039          |
| 60.0                        | -.026           | 1.593          | -.015         | .009            | .005           | .008          | 150.0          | .139            | -.768          | .051          | .048            | .006           | .040          |
| 65.0                        | .036            | 1.422          | -.008         | .037            | .005           | .014          | 155.0          | .126            | -.805          | .049          | .035            | .006           | .040          |
| 70.0                        | .085            | 1.191          | -.003         | .076            | .005           | .020          | 160.0          | .109            | -.876          | .053          | .022            | .006           | .040          |
| 75.0                        | .112            | .982           | .005          | .098            | .005           | .025          | 165.0          | .087            | -.874          | .053          | .012            | .006           | .040          |
| 80.0                        | .125            | .622           | .011          | .108            | .005           | .027          | 170.0          | .063            | -.918          | .053          | .001            | .005           | .040          |
| 85.0                        | .129            | .383           | .016          | .114            | .006           | .030          | 175.0          | .030            | -.941          | .054          | -.009           | .005           | .039          |
| 90.0                        | .132            | .094           | .020          | .116            | .006           | .031          | 180.0          | -.022           | -.948          | .054          | -.018           | .005           | .040          |

| ***AZIMUTH ANGLE = 15.0**** |                 |                |               |                 |                |               |                |                 |                |               |                 |                |               |
|-----------------------------|-----------------|----------------|---------------|-----------------|----------------|---------------|----------------|-----------------|----------------|---------------|-----------------|----------------|---------------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
| 0                           | -.032           | 1.525          | -.022         | .068            | -.006          | -.021         | 90.0           | .122            | .141           | .034          | .122            | .009           | .047          |
| 5.0                         | -.032           | 1.485          | -.021         | .071            | -.005          | -.020         | 95.0           | .122            | -.106          | .040          | .121            | .009           | .050          |
| 10.0                        | -.033           | 1.485          | -.021         | .070            | -.004          | -.020         | 100.0          | .123            | -.293          | .045          | .121            | .009           | .052          |
| 15.0                        | -.034           | 1.485          | -.022         | .068            | -.003          | -.021         | 105.0          | .126            | -.454          | .052          | .120            | .009           | .054          |
| 20.0                        | -.037           | 1.485          | -.022         | .062            | -.002          | -.022         | 110.0          | .133            | -.602          | .054          | .118            | .010           | .054          |
| 25.0                        | -.042           | 1.485          | -.024         | .055            | -.001          | -.023         | 115.0          | .143            | -.711          | .058          | .116            | .010           | .055          |
| 30.0                        | -.047           | 1.495          | -.027         | .047            | .001           | -.025         | 120.0          | .153            | -.767          | .062          | .111            | .010           | .056          |
| 35.0                        | -.054           | 1.515          | -.030         | .035            | .002           | -.026         | 125.0          | .154            | -.732          | .065          | .103            | .010           | .057          |
| 40.0                        | -.062           | 1.545          | -.033         | .010            | .003           | -.025         | 130.0          | .152            | -.693          | .067          | .095            | .010           | .057          |
| 45.0                        | -.066           | 1.574          | -.034         | .042            | .005           | -.020         | 135.0          | .150            | -.666          | .070          | .086            | .011           | .057          |
| 50.0                        | -.061           | 1.574          | -.031         | .050            | .006           | -.012         | 140.0          | .145            | -.685          | .072          | .073            | .011           | .058          |
| 55.0                        | -.043           | 1.564          | -.025         | .027            | .006           | -.001         | 145.0          | .140            | -.713          | .073          | .060            | .011           | .058          |
| 60.0                        | .000            | 1.474          | -.017         | .011            | .007           | .012          | 150.0          | .133            | -.756          | .075          | .047            | .010           | .059          |
| 65.0                        | .052            | 1.333          | -.007         | .055            | .007           | .021          | 155.0          | .125            | -.791          | .073          | .033            | .010           | .060          |
| 70.0                        | .088            | 1.162          | .001          | .094            | .008           | .030          | 160.0          | .114            | -.874          | .078          | .018            | .009           | .060          |
| 75.0                        | .108            | .983           | .013          | .113            | .008           | .037          | 165.0          | .096            | -.871          | .079          | .005            | .009           | .060          |
| 80.0                        | .117            | .683           | .021          | .120            | .008           | .041          | 170.0          | .075            | -.900          | .079          | -.010           | .008           | .059          |
| 85.0                        | .121            | .424           | .028          | .122            | .009           | .045          | 175.0          | .042            | -.931          | .080          | -.026           | .008           | .058          |
| 90.0                        | .122            | .141           | .034          | .122            | .009           | .047          | 180.0          | -.018           | -.942          | .081          | -.038           | .007           | .060          |

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Table A-2 cont'd

| ****AZIMUTH ANGLE = 20.0**** |                    |       |       |                     |       |       |                |                    |       |      |                     |      |      |
|------------------------------|--------------------|-------|-------|---------------------|-------|-------|----------------|--------------------|-------|------|---------------------|------|------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       |       | MOMENT COEFFICIENTS |       |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      |
|                              | NORMAL             | AXIAL | SIDE  | PITCH               | ROLL  | YAW   |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |
| 0                            | -.029              | 1.542 | -.029 | .055                | -.008 | -.026 | 90.0           | .118               | .059  | .054 | .121                | .007 | .053 |
| 5.0                          | -.030              | 1.485 | -.028 | .060                | -.006 | -.025 | 95.0           | .118               | -.171 | .061 | .120                | .007 | .057 |
| 10.0                         | -.031              | 1.472 | -.028 | .062                | -.005 | -.024 | 100.0          | .119               | -.360 | .067 | .120                | .007 | .059 |
| 15.0                         | -.033              | 1.472 | -.028 | .064                | -.003 | -.024 | 105.0          | .121               | -.514 | .074 | .119                | .007 | .062 |
| 20.0                         | -.037              | 1.472 | -.028 | .061                | -.002 | -.025 | 110.0          | .127               | -.661 | .077 | .117                | .008 | .063 |
| 25.0                         | -.042              | 1.489 | -.030 | .058                | .000  | -.026 | 115.0          | .135               | -.776 | .082 | .115                | .008 | .065 |
| 30.0                         | -.047              | 1.499 | -.032 | .052                | .000  | -.028 | 120.0          | .143               | -.815 | .086 | .111                | .008 | .067 |
| 35.0                         | -.053              | 1.549 | -.035 | .036                | .000  | -.031 | 125.0          | .145               | -.784 | .090 | .104                | .008 | .068 |
| 40.0                         | -.059              | 1.599 | -.038 | -.009               | .001  | -.034 | 130.0          | .144               | -.728 | .092 | .094                | .008 | .068 |
| 45.0                         | -.061              | 1.644 | -.039 | -.039               | .002  | -.036 | 135.0          | .142               | -.684 | .095 | .082                | .009 | .070 |
| 50.0                         | -.056              | 1.653 | -.037 | -.048               | .003  | -.032 | 140.0          | .138               | -.675 | .097 | .068                | .009 | .071 |
| 55.0                         | -.039              | 1.616 | -.031 | -.030               | .004  | -.015 | 145.0          | .134               | -.675 | .099 | .055                | .009 | .072 |
| 60.0                         | -.003              | 1.518 | -.021 | -.010               | .005  | .001  | 150.0          | .128               | -.698 | .101 | .042                | .008 | .073 |
| 65.0                         | .043               | 1.323 | -.004 | .056                | .005  | .015  | 155.0          | .120               | -.718 | .100 | .030                | .008 | .074 |
| 70.0                         | .084               | 1.140 | .010  | .094                | .006  | .028  | 160.0          | .116               | -.646 | .128 | .027                | .006 | .074 |
| 75.0                         | .107               | .897  | .026  | .112                | .006  | .038  | 165.0          | .109               | -.771 | .104 | .017                | .007 | .074 |
| 80.0                         | .115               | .596  | .036  | .119                | .006  | .044  | 170.0          | .092               | -.780 | .105 | .006                | .007 | .074 |
| 85.0                         | .118               | .333  | .046  | .121                | .007  | .049  | 175.0          | .071               | -.814 | .105 | -.007               | .006 | .073 |
| 90.0                         | .118               | .059  | .054  | .121                | .007  | .053  | 180.0          | .039               | -.854 | .106 | -.020               | .006 | .071 |

| ****AZIMUTH ANGLE = 25.0**** |                    |       |       |                     |       |       |                |                    |       |      |                     |      |      |
|------------------------------|--------------------|-------|-------|---------------------|-------|-------|----------------|--------------------|-------|------|---------------------|------|------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       |       | MOMENT COEFFICIENTS |       |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      |
|                              | NORMAL             | AXIAL | SIDE  | PITCH               | ROLL  | YAW   |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |
| 0                            | -.017              | -.871 | .106  | -.031               | .005  | .074  | 90.0           | .115               | .242  | .064 | .120                | .005 | .054 |
| 5.0                          | -.027              | 1.559 | -.036 | .042                | -.010 | -.032 | 95.0           | .115               | -.021 | .074 | .120                | .005 | .059 |
| 10.0                         | -.028              | 1.486 | -.035 | .049                | -.008 | -.030 | 100.0          | .114               | -.237 | .082 | .120                | .005 | .064 |
| 15.0                         | -.030              | 1.459 | -.035 | .055                | -.006 | -.028 | 105.0          | .115               | -.427 | .089 | .119                | .005 | .067 |
| 20.0                         | -.032              | 1.459 | -.035 | .061                | -.003 | -.027 | 110.0          | .116               | -.575 | .096 | .118                | .005 | .070 |
| 25.0                         | -.037              | 1.459 | -.035 | .061                | -.002 | -.028 | 115.0          | .122               | -.721 | .101 | .116                | .006 | .073 |
| 30.0                         | -.042              | 1.493 | -.036 | .061                | .000  | -.029 | 120.0          | .127               | -.842 | .106 | .115                | .006 | .075 |
| 35.0                         | -.048              | 1.503 | -.037 | .057                | .000  | -.031 | 125.0          | .133               | -.863 | .111 | .112                | .006 | .078 |
| 40.0                         | -.052              | 1.583 | -.040 | .038                | .000  | -.036 | 130.0          | .136               | -.836 | .115 | .105                | .007 | .080 |
| 45.0                         | -.056              | 1.653 | -.043 | -.008               | -.001 | -.044 | 135.0          | .136               | -.764 | .117 | .093                | .007 | .081 |
| 50.0                         | -.056              | 1.715 | -.044 | -.036               | -.001 | -.053 | 140.0          | .134               | -.702 | .120 | .079                | .007 | .083 |
| 55.0                         | -.051              | 1.732 | -.043 | -.047               | .000  | -.053 | 145.0          | .132               | -.665 | .123 | .063                | .007 | .084 |
| 60.0                         | -.035              | 1.669 | -.037 | -.033               | .002  | -.029 | 150.0          | .128               | -.637 | .125 | .051                | .007 | .086 |
| 65.0                         | -.006              | 1.562 | -.025 | .010                | .004  | -.008 | 155.0          | .123               | -.641 | .127 | .038                | .007 | .087 |
| 70.0                         | .035               | 1.314 | -.001 | .057                | .004  | .010  | 160.0          | .104               | -.668 | .131 | .016                | .005 | .088 |
| 75.0                         | .081               | 1.118 | .020  | .095                | .004  | .027  | 165.0          | .088               | -.690 | .131 | .007                | .005 | .088 |
| 80.0                         | .107               | .811  | .039  | .112                | .004  | .040  | 170.0          | .068               | -.728 | .131 | -.004               | .004 | .088 |
| 85.0                         | .114               | .509  | .052  | .118                | .005  | .047  | 175.0          | .036               | -.777 | .132 | -.015               | .004 | .084 |
| 90.0                         | .115               | .242  | .064  | .120                | .005  | .054  | 180.0          | -.016              | -.800 | .132 | -.025               | .003 | .088 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 30.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |      |
|                            | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL | YAW  |
| 0                          | -.025              | 1.577 | -.044               | -.013 | 90.0           | .112               | -.103 | .120                | .004 | .120                | .004 | .065 |
| 5.0                        | -.026              | 1.487 | -.043               | -.010 | 95.0           | .111               | -.303 | .120                | .004 | .119                | .004 | .071 |
| 10.0                       | -.029              | 1.447 | -.042               | -.007 | 100.0          | .111               | -.495 | .119                | .004 | .117                | .004 | .075 |
| 15.0                       | -.032              | 1.447 | -.042               | -.031 | 105.0          | .112               | -.636 | .117                | .004 | .116                | .005 | .083 |
| 20.0                       | -.037              | 1.447 | -.042               | -.002 | 110.0          | .117               | -.781 | .115                | .005 | .113                | .005 | .086 |
| 25.0                       | -.042              | 1.497 | -.042               | .000  | 115.0          | .120               | -.908 | .107                | .006 | .107                | .006 | .092 |
| 30.0                       | -.049              | 1.507 | -.043               | .000  | 120.0          | .123               | -.912 | .092                | .006 | .092                | .006 | .094 |
| 35.0                       | -.052              | 1.617 | -.045               | .000  | 125.0          | .127               | -.888 | .076                | .006 | .076                | .006 | .097 |
| 40.0                       | -.053              | 1.707 | -.048               | -.003 | 130.0          | .128               | -.800 | .059                | .006 | .059                | .006 | .098 |
| 45.0                       | -.052              | 1.786 | -.050               | -.004 | 135.0          | .126               | -.656 | .047                | .006 | .047                | .006 | .100 |
| 50.0                       | -.046              | 1.812 | -.049               | -.002 | 140.0          | .122               | -.600 | .034                | .006 | .034                | .006 | .101 |
| 55.0                       | -.031              | 1.722 | -.044               | .001  | 145.0          | .118               | -.584 | .025                | .005 | .025                | .005 | .102 |
| 60.0                       | -.009              | 1.606 | -.029               | .002  | 150.0          | .112               | -.574 | .008                | .004 | .008                | .004 | .103 |
| 65.0                       | .027               | 1.305 | .001                | .003  | 155.0          | .100               | -.566 | -.002               | .003 | -.002               | .003 | .103 |
| 70.0                       | .078               | 1.096 | .030                | .003  | 160.0          | .085               | -.600 | -.010               | .002 | -.010               | .002 | .098 |
| 75.0                       | .107               | .725  | .052                | .003  | 165.0          | .065               | -.643 | -.019               | .002 | -.019               | .002 | .103 |
| 80.0                       | .113               | .422  | .068                | .004  | 170.0          | .034               | -.700 | -.015               | .001 | -.015               | .001 | .112 |
| 85.0                       | .113               | .151  | .083                | .004  | 175.0          | -.016              | -.730 |                     |      |                     |      |      |
| 90.0                       | .112               | -.103 | .094                | .004  | 180.0          |                    |       |                     |      |                     |      |      |

| ***AZIMUTH ANGLE = 35.0*** |                    |       |                     |       |                |                    |       |                     |      |                     |      |      |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|---------------------|------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |      |
|                            | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL | YAW  |
| 0                          | -.023              | 1.557 | -.048               | -.002 | 90.0           | .109               | -.103 | .112                | .002 | .112                | .002 | .070 |
| 5.0                        | -.024              | 1.511 | -.048               | -.005 | 95.0           | .109               | -.296 | .112                | .002 | .112                | .002 | .075 |
| 10.0                       | -.026              | 1.497 | -.048               | -.002 | 100.0          | .109               | -.465 | .111                | .002 | .111                | .002 | .079 |
| 15.0                       | -.027              | 1.501 | -.049               | .000  | 105.0          | .110               | -.590 | .110                | .002 | .110                | .002 | .083 |
| 20.0                       | -.030              | 1.501 | -.053               | .000  | 110.0          | .115               | -.696 | .107                | .004 | .107                | .004 | .086 |
| 25.0                       | -.032              | 1.537 | -.053               | .000  | 115.0          | .118               | -.802 | .106                | .004 | .106                | .004 | .089 |
| 30.0                       | -.035              | 1.547 | -.052               | .000  | 120.0          | .120               | -.792 | .103                | .004 | .103                | .004 | .092 |
| 35.0                       | -.035              | 1.617 | -.050               | .000  | 125.0          | .123               | -.736 | .097                | .004 | .097                | .004 | .095 |
| 40.0                       | -.033              | 1.674 | -.048               | -.001 | 130.0          | .124               | -.633 | .086                | .003 | .086                | .003 | .098 |
| 45.0                       | -.030              | 1.720 | -.045               | -.001 | 135.0          | .123               | -.547 | .074                | .003 | .074                | .003 | .101 |
| 50.0                       | -.023              | 1.710 | -.035               | .000  | 140.0          | .121               | -.504 | .060                | .003 | .060                | .003 | .103 |
| 55.0                       | -.008              | 1.617 | -.023               | .003  | 145.0          | .116               | -.493 | .047                | .004 | .047                | .004 | .106 |
| 60.0                       | .011               | 1.500 | -.006               | .003  | 150.0          | .110               | -.508 | .034                | .005 | .034                | .005 | .107 |
| 65.0                       | .042               | 1.239 | .020                | .003  | 155.0          | .102               | -.517 | .025                | .005 | .025                | .005 | .109 |
| 70.0                       | .082               | 1.011 | .046                | .002  | 160.0          | .090               | -.540 | .017                | .004 | .017                | .004 | .111 |
| 75.0                       | .106               | .658  | .064                | .002  | 165.0          | .075               | -.570 | .010                | .004 | .010                | .004 | .110 |
| 80.0                       | .111               | .381  | .080                | .002  | 170.0          | .057               | -.603 | .000                | .003 | .000                | .003 | .111 |
| 85.0                       | .110               | .135  | .092                | .002  | 175.0          | .029               | -.661 | -.006               | .002 | -.006               | .002 | .108 |
| 90.0                       | .109               | -.103 | .104                | .002  | 180.0          | -.012              | -.686 | -.015               | .001 | -.015               | .001 | .112 |

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Table A-2 cont'd

| ****AZIMUTH ANGLE = 40.0**** |                    |       |                     |      |                |                 |                    |      |                     |       |                |                 |
|------------------------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------------|------|---------------------|-------|----------------|-----------------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL |
|                              | AXIAL              | SIDE  | PITCH               | ROLL | YAW            |                 | AXIAL              | SIDE | PITCH               | ROLL  |                |                 |
| 0                            | -.022              | 1.538 | -.053               | .033 | -.042          | 90.0            | -.104              | .114 | .104                | .000  | 90.0           | -.104           |
| 5.0                          | -.022              | 1.535 | -.053               | .041 | -.041          | 95.0            | -.290              | .121 | .105                | .000  | 95.0           | -.290           |
| 10.0                         | -.023              | 1.548 | -.054               | .048 | -.043          | 100.0           | -.436              | .125 | .104                | .001  | 100.0          | -.436           |
| 15.0                         | -.022              | 1.555 | -.056               | .056 | -.047          | 105.0           | -.544              | .129 | .103                | .001  | 105.0          | -.544           |
| 20.0                         | -.023              | 1.555 | -.064               | .061 | -.054          | 110.0           | -.611              | .131 | .099                | .003  | 110.0          | -.611           |
| 25.0                         | -.022              | 1.578 | -.064               | .066 | -.062          | 115.0           | -.696              | .133 | .097                | .003  | 115.0          | -.696           |
| 30.0                         | -.021              | 1.588 | -.061               | .067 | -.066          | 120.0           | -.672              | .138 | .093                | .003  | 120.0          | -.672           |
| 35.0                         | -.018              | 1.618 | -.055               | .060 | -.064          | 125.0           | -.585              | .146 | .087                | .002  | 125.0          | -.585           |
| 40.0                         | -.014              | 1.641 | -.048               | .041 | -.058          | 130.0           | -.466              | .155 | .081                | .000  | 130.0          | -.466           |
| 45.0                         | -.008              | 1.654 | -.040               | .030 | -.048          | 135.0           | -.373              | .165 | .073                | .000  | 135.0          | -.373           |
| 50.0                         | -.000              | 1.609 | -.022               | .025 | -.036          | 140.0           | -.352              | .171 | .061                | .000  | 140.0          | -.352           |
| 55.0                         | .014               | 1.512 | -.002               | .028 | -.008          | 145.0           | -.387              | .175 | .047                | .002  | 145.0          | -.387           |
| 60.0                         | .032               | 1.394 | .016                | .047 | .013           | 150.0           | -.433              | .178 | .034                | .005  | 150.0          | -.433           |
| 65.0                         | .057               | 1.173 | .039                | .079 | .029           | 155.0           | -.460              | .180 | .026                | .006  | 155.0          | -.460           |
| 70.0                         | .087               | .926  | .062                | .090 | .043           | 160.0           | -.514              | .183 | .018                | .005  | 160.0          | -.514           |
| 75.0                         | .105               | .592  | .077                | .101 | .054           | 165.0           | -.541              | .183 | .012                | .004  | 165.0          | -.541           |
| 80.0                         | .109               | .341  | .092                | .104 | .061           | 170.0           | -.563              | .184 | .003                | .003  | 170.0          | -.563           |
| 85.0                         | .108               | .119  | .102                | .105 | .064           | 175.0           | -.622              | .184 | -.003               | .002  | 175.0          | -.622           |
| 90.0                         | .107               | -.104 | .114                | .104 | .075           | 180.0           | -.643              | .186 | -.011               | .001  | 180.0          | -.643           |
| ****AZIMUTH ANGLE = 45.0**** |                    |       |                     |      |                |                 |                    |      |                     |       |                |                 |
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL |
|                              | AXIAL              | SIDE  | PITCH               | ROLL | YAW            |                 | AXIAL              | SIDE | PITCH               | ROLL  |                |                 |
| 0                            | -.021              | 1.519 | -.058               | .035 | -.044          | 90.0            | -.105              | .124 | .097                | -.001 | 90.0           | -.105           |
| 5.0                          | -.020              | 1.559 | -.059               | .042 | -.044          | 95.0            | -.284              | .130 | .098                | -.001 | 95.0           | -.284           |
| 10.0                         | -.020              | 1.599 | -.061               | .048 | -.048          | 100.0           | -.407              | .132 | .097                | .000  | 100.0          | -.407           |
| 15.0                         | -.018              | 1.609 | -.064               | .055 | -.055          | 105.0           | -.498              | .134 | .096                | .000  | 105.0          | -.498           |
| 20.0                         | -.016              | 1.609 | -.075               | .061 | -.066          | 110.0           | -.526              | .135 | .091                | .002  | 110.0          | -.526           |
| 25.0                         | -.012              | 1.619 | -.075               | .067 | -.077          | 115.0           | -.590              | .135 | .088                | .003  | 115.0          | -.590           |
| 30.0                         | -.008              | 1.629 | -.070               | .070 | -.082          | 120.0           | -.553              | .140 | .083                | .003  | 120.0          | -.553           |
| 35.0                         | -.002              | 1.619 | -.060               | .070 | -.076          | 125.0           | -.434              | .150 | .078                | .001  | 125.0          | -.434           |
| 40.0                         | -.005              | 1.609 | -.048               | .066 | -.060          | 130.0           | -.300              | .162 | .076                | .002  | 130.0          | -.300           |
| 45.0                         | .013               | 1.588 | -.035               | .062 | -.038          | 135.0           | -.200              | .175 | .072                | .003  | 135.0          | -.200           |
| 50.0                         | .022               | 1.508 | -.009               | .061 | -.017          | 140.0           | -.200              | .182 | .063                | -.002 | 140.0          | -.200           |
| 55.0                         | .037               | 1.408 | .019                | .061 | .010           | 145.0           | -.281              | .188 | .047                | .001  | 145.0          | -.281           |
| 60.0                         | .053               | 1.288 | .039                | .066 | .029           | 150.0           | -.358              | .191 | .035                | .005  | 150.0          | -.358           |
| 65.0                         | .072               | 1.107 | .059                | .076 | .042           | 155.0           | -.403              | .193 | .027                | .007  | 155.0          | -.403           |
| 70.0                         | .092               | .841  | .079                | .084 | .052           | 160.0           | -.488              | .196 | .020                | .006  | 160.0          | -.488           |
| 75.0                         | .105               | .526  | .090                | .096 | .060           | 165.0           | -.512              | .197 | .014                | .005  | 165.0          | -.512           |
| 80.0                         | .108               | .301  | .105                | .098 | .067           | 170.0           | -.523              | .197 | .006                | .004  | 170.0          | -.523           |
| 85.0                         | .106               | .103  | .112                | .098 | .067           | 175.0           | -.583              | .197 | .000                | .003  | 175.0          | -.583           |
| 90.0                         | .105               | -.105 | .124                | .097 | .080           | 180.0           | -.600              | .200 | -.008               | .001  | 180.0          | -.600           |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 50.0**** |                 |                |                      |                 |      |       |                |                 |                |                      |                 |       |      |
|-----------------------------|-----------------|----------------|----------------------|-----------------|------|-------|----------------|-----------------|----------------|----------------------|-----------------|-------|------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | ROLL | YAW   | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | ROLL  | YAW  |
| 0                           | .014            | 1.539          | -.064                | .066            | .018 | -.054 | 90.0           | .098            | -.051          | .132                 | .086            | .000  | .086 |
| 5.0                         | .006            | 1.583          | -.064                | .066            | .008 | -.051 | 95.0           | .098            | -.209          | .136                 | .086            | .000  | .090 |
| 10.0                        | -.001           | 1.616          | -.063                | .064            | .012 | -.053 | 100.0          | .098            | -.335          | .136                 | .084            | .000  | .093 |
| 15.0                        | -.006           | 1.629          | -.064                | .066            | .010 | -.053 | 105.0          | .100            | -.421          | .139                 | .082            | .000  | .095 |
| 20.0                        | -.009           | 1.626          | -.066                | .069            | .009 | -.057 | 110.0          | .101            | -.465          | .140                 | .077            | .002  | .098 |
| 25.0                        | -.010           | 1.616          | -.060                | .074            | .008 | -.059 | 115.0          | .102            | -.539          | .145                 | .073            | .002  | .100 |
| 30.0                        | -.008           | 1.596          | -.056                | .076            | .008 | -.058 | 120.0          | .103            | -.532          | .145                 | .068            | .003  | .100 |
| 35.0                        | -.002           | 1.549          | -.036                | .075            | .008 | -.045 | 125.0          | .102            | -.464          | .153                 | .063            | .002  | .105 |
| 40.0                        | .006            | 1.499          | -.022                | .071            | .008 | -.031 | 130.0          | .101            | -.384          | .164                 | .059            | .001  | .109 |
| 45.0                        | .015            | 1.446          | -.006                | .065            | .007 | -.013 | 135.0          | .099            | -.311          | .176                 | .056            | .000  | .112 |
| 50.0                        | .025            | 1.354          | .019                 | .062            | .004 | .005  | 140.0          | .095            | -.273          | .183                 | .048            | .000  | .117 |
| 55.0                        | .039            | 1.247          | .046                 | .060            | .006 | .026  | 145.0          | .089            | -.272          | .192                 | .036            | .001  | .121 |
| 60.0                        | .054            | 1.126          | .066                 | .064            | .005 | .042  | 150.0          | .082            | -.279          | .194                 | .027            | .003  | .124 |
| 65.0                        | .072            | .962           | .082                 | .072            | .003 | .051  | 155.0          | .072            | -.310          | .200                 | .021            | .003  | .128 |
| 70.0                        | .085            | .738           | .097                 | .081            | .001 | .063  | 160.0          | .062            | -.369          | .204                 | .015            | .002  | .132 |
| 75.0                        | .096            | .483           | .107                 | .087            | .000 | .070  | 165.0          | .048            | -.391          | .207                 | .010            | .001  | .132 |
| 80.0                        | .099            | .291           | .118                 | .088            | .000 | .077  | 170.0          | .032            | -.402          | .208                 | .004            | .000  | .132 |
| 85.0                        | .098            | .125           | .124                 | .088            | .000 | .078  | 175.0          | .014            | -.442          | .209                 | .000            | .000  | .134 |
| 90.0                        | .098            | -.051          | .132                 | .086            | .000 | .086  | 180.0          | -.010           | -.454          | .211                 | -.006           | -.001 | .135 |

| ***AZIMUTH ANGLE = 55.0**** |                 |                |                      |                 |      |       |                |                 |                |                      |                 |       |      |
|-----------------------------|-----------------|----------------|----------------------|-----------------|------|-------|----------------|-----------------|----------------|----------------------|-----------------|-------|------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | ROLL | YAW   | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | COEFFICIENTS<br>SIDE | MOMENT<br>PITCH | ROLL  | YAW  |
| 0                           | .049            | 1.560          | -.070                | .098            | .018 | -.064 | 90.0           | .091            | .003           | .141                 | .075            | .001  | .093 |
| 5.0                         | .033            | 1.607          | -.069                | .090            | .013 | -.058 | 95.0           | .091            | -.135          | .143                 | .074            | .000  | .096 |
| 10.0                        | .016            | 1.633          | -.066                | .081            | .015 | -.059 | 100.0          | .091            | -.264          | .140                 | .071            | .001  | .097 |
| 15.0                        | .005            | 1.650          | -.064                | .077            | .014 | -.051 | 105.0          | .092            | -.345          | .144                 | .068            | .001  | .100 |
| 20.0                        | -.002           | 1.643          | -.057                | .078            | .014 | -.048 | 110.0          | .091            | -.404          | .145                 | .063            | .002  | .102 |
| 25.0                        | -.008           | 1.613          | -.045                | .082            | .014 | -.042 | 115.0          | .090            | -.489          | .145                 | .059            | .002  | .104 |
| 30.0                        | -.008           | 1.563          | -.043                | .083            | .015 | -.034 | 120.0          | .090            | -.511          | .150                 | .054            | .003  | .101 |
| 35.0                        | -.002           | 1.480          | -.013                | .081            | .014 | -.015 | 125.0          | .087            | -.494          | .156                 | .049            | .003  | .108 |
| 40.0                        | .007            | 1.390          | -.004                | .076            | .013 | -.003 | 130.0          | .085            | -.468          | .166                 | .042            | .004  | .112 |
| 45.0                        | .017            | 1.304          | .021                 | .068            | .010 | .010  | 135.0          | .083            | -.422          | .178                 | .040            | .003  | .116 |
| 50.0                        | .029            | 1.200          | .047                 | .063            | .003 | .027  | 140.0          | .079            | -.347          | .184                 | .034            | .001  | .121 |
| 55.0                        | .042            | 1.086          | .073                 | .060            | .006 | .043  | 145.0          | .074            | -.263          | .196                 | .026            | .001  | .124 |
| 60.0                        | .055            | .964           | .093                 | .062            | .004 | .056  | 150.0          | .069            | -.200          | .197                 | .019            | .001  | .128 |
| 65.0                        | .072            | .817           | .105                 | .069            | .002 | .060  | 155.0          | .061            | -.218          | .207                 | .015            | .000  | .131 |
| 70.0                        | .079            | .636           | .116                 | .075            | .001 | .074  | 160.0          | .052            | -.250          | .212                 | .010            | .001  | .137 |
| 75.0                        | .087            | .440           | .124                 | .079            | .000 | .080  | 165.0          | .040            | -.270          | .217                 | .006            | .001  | .136 |
| 80.0                        | .090            | .282           | .131                 | .079            | .000 | .087  | 170.0          | .024            | -.282          | .220                 | .002            | .002  | .136 |
| 85.0                        | .090            | .147           | .136                 | .078            | .000 | .089  | 175.0          | .007            | -.301          | .222                 | .001            | .002  | .139 |
| 90.0                        | .091            | .003           | .141                 | .075            | .001 | .093  | 180.0          | -.014           | -.308          | .223                 | -.004           | -.003 | .140 |



Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 60.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW   |                | NORMAL             | AXIAL | PITCH               | ROLL  |
| 0              | .085               | 1.581 | -.076               | -.075 | 90.0           | .084               | .057  | .065                | .002  |
| 5.0            | .060               | 1.631 | -.075               | -.065 | 95.0           | .084               | -.061 | .062                | .001  |
| 10.0           | .035               | 1.651 | -.069               | -.065 | 100.0          | .084               | -.193 | .058                | .002  |
| 15.0           | .017               | 1.671 | -.065               | -.050 | 105.0          | .084               | -.269 | .054                | .002  |
| 20.0           | -.004              | 1.661 | -.049               | -.040 | 110.0          | .082               | -.344 | .050                | .002  |
| 25.0           | -.006              | 1.611 | -.030               | -.025 | 115.0          | .079               | -.439 | .045                | .002  |
| 30.0           | -.008              | 1.531 | -.030               | -.022 | 120.0          | .077               | -.524 | .040                | .003  |
| 35.0           | -.002              | 1.411 | .010                | .015  | 125.0          | .073               | -.524 | .035                | .005  |
| 40.0           | .009               | 1.281 | .030                | .025  | 130.0          | .070               | -.553 | .025                | .007  |
| 45.0           | .020               | 1.162 | .050                | .035  | 135.0          | .067               | -.534 | .025                | .006  |
| 50.0           | .033               | 1.046 | .075                | .050  | 140.0          | .064               | -.421 | .020                | .003  |
| 55.0           | .045               | .926  | .100                | .060  | 145.0          | .060               | -.254 | .016                | .001  |
| 60.0           | .056               | .802  | .120                | .070  | 150.0          | .056               | -.121 | .012                | -.001 |
| 65.0           | .073               | .673  | .129                | .070  | 155.0          | .050               | -.126 | .009                | -.003 |
| 70.0           | .073               | .534  | .135                | .085  | 160.0          | .042               | -.131 | .006                | -.005 |
| 75.0           | .078               | .397  | .142                | .090  | 165.0          | .032               | -.150 | .002                | -.005 |
| 80.0           | .081               | .273  | .145                | .098  | 170.0          | .016               | -.162 | .000                | -.006 |
| 85.0           | .083               | .169  | .148                | .100  | 175.0          | .000               | -.161 | -.002               | -.005 |
| 90.0           | .084               | .057  | .150                | .100  | 180.0          | -.019              | -.163 | -.002               | -.005 |

\*\*\*AZIMUTH ANGLE = 65.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW   |                | NORMAL             | AXIAL | PITCH               | ROLL |
| 0              | .057               | 1.345 | -.005               | -.028 | 90.0           | .070               | .078  | .053                | .000 |
| 5.0            | .041               | 1.365 | -.004               | -.021 | 95.0           | .069               | -.075 | .051                | .000 |
| 10.0           | .025               | 1.385 | -.001               | -.019 | 100.0          | .070               | -.189 | .048                | .000 |
| 15.0           | .014               | 1.395 | .001                | -.008 | 105.0          | .069               | -.265 | .045                | .000 |
| 20.0           | .006               | 1.375 | .011                | .000  | 110.0          | .068               | -.336 | .042                | .000 |
| 25.0           | .000               | 1.332 | .023                | .011  | 115.0          | .066               | -.420 | .038                | .000 |
| 30.0           | .000               | 1.279 | .023                | .022  | 120.0          | .064               | -.472 | .034                | .000 |
| 35.0           | .005               | 1.165 | .051                | .040  | 125.0          | .061               | -.510 | .029                | .002 |
| 40.0           | .014               | 1.065 | .066                | .047  | 130.0          | .058               | -.512 | .021                | .003 |
| 45.0           | .023               | .969  | .081                | .054  | 135.0          | .055               | -.489 | .019                | .003 |
| 50.0           | .034               | .875  | .099                | .065  | 140.0          | .053               | -.418 | .011                | .001 |
| 55.0           | .043               | .775  | .117                | .072  | 145.0          | .049               | -.317 | .005                | .000 |
| 60.0           | .050               | .669  | .132                | .079  | 150.0          | .046               | -.241 | .000                | .000 |
| 65.0           | .062               | .559  | .138                | .090  | 155.0          | .040               | -.248 | .000                | .002 |
| 70.0           | .062               | .443  | .143                | .093  | 160.0          | .034               | -.255 | .000                | .003 |
| 75.0           | .066               | .332  | .148                | .099  | 165.0          | .025               | -.271 | .001                | .003 |
| 80.0           | .068               | .222  | .150                | .100  | 170.0          | .013               | -.278 | -.001               | .003 |
| 85.0           | .069               | .146  | .153                | .100  | 175.0          | .000               | -.282 | -.002               | .003 |
| 90.0           | .070               | .078  | .154                | .100  | 180.0          | -.014              | -.282 | -.001               | .003 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 70.0**** |                    |       |                     |       |                |                    |       |                     |       |      |  |      |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|------|--|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | SIDE |  | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL  |      |  |      |
| 0                           | .029               | 1.110 | .046                | .014  | 90.0           | .056               | .100  | .042                | -.001 | .159 |  | .101 |
| 5.0                         | .022               | 1.100 | .045                | .014  | 95.0           | .055               | -.089 | .041                | -.001 | .160 |  | .102 |
| 10.0                        | .016               | 1.120 | .044                | .014  | 100.0          | .056               | -.185 | .039                | -.001 | .159 |  | .102 |
| 15.0                        | .012               | 1.120 | .047                | .014  | 105.0          | .055               | -.261 | .036                | -.002 | .161 |  | .103 |
| 20.0                        | .009               | 1.090 | .057                | .014  | 110.0          | .054               | -.328 | .034                | -.002 | .161 |  | .103 |
| 25.0                        | .007               | 1.053 | .071                | .014  | 115.0          | .053               | -.401 | .031                | -.002 | .161 |  | .111 |
| 30.0                        | .008               | 1.027 | .083                | .014  | 120.0          | .051               | -.454 | .028                | -.001 | .163 |  | .103 |
| 35.0                        | .012               | .920  | .080                | .013  | 125.0          | .049               | -.496 | .024                | -.001 | .164 |  | .105 |
| 40.0                        | .019               | .850  | .070                | .011  | 130.0          | .046               | -.471 | .017                | .000  | .166 |  | .106 |
| 45.0                        | .026               | .776  | .057                | .007  | 135.0          | .044               | -.444 | .013                | .000  | .170 |  | .110 |
| 50.0                        | .036               | .704  | .050                | .003  | 140.0          | .042               | -.415 | .003                | -.001 | .171 |  | .109 |
| 55.0                        | .041               | .624  | .046                | .003  | 145.0          | .038               | -.380 | -.006               | -.001 | .177 |  | .113 |
| 60.0                        | .045               | .536  | .043                | .001  | 150.0          | .036               | -.361 | -.012               | -.001 | .179 |  | .115 |
| 65.0                        | .051               | .445  | .044                | .000  | 155.0          | .031               | -.370 | -.010               | -.001 | .186 |  | .115 |
| 70.0                        | .052               | .353  | .045                | .000  | 160.0          | .026               | -.379 | -.006               | -.001 | .190 |  | .116 |
| 75.0                        | .054               | .267  | .045                | .000  | 165.0          | .019               | -.392 | -.004               | -.001 | .195 |  | .117 |
| 80.0                        | .055               | .172  | .045                | -.001 | 170.0          | .010               | -.394 | -.003               | -.001 | .197 |  | .116 |
| 85.0                        | .055               | .124  | .044                | -.001 | 175.0          | .000               | -.395 | -.002               | -.001 | .197 |  | .117 |
| 90.0                        | .056               | .100  | .042                | -.001 | 180.0          | -.009              | -.401 | -.001               | -.001 | .196 |  | .118 |

| ***AZIMUTH ANGLE = 75.0**** |                    |       |                     |       |                |                    |       |                     |       |      |  |      |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|------|--|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | SIDE |  | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL  |      |  |      |
| 0                           | .002               | .875  | .005                | .013  | 90.0           | .043               | .122  | .031                | -.003 | .164 |  | .102 |
| 5.0                         | .003               | .835  | .011                | .013  | 95.0           | .041               | -.103 | .031                | -.003 | .165 |  | .102 |
| 10.0                        | .007               | .855  | .018                | .012  | 100.0          | .042               | -.182 | .030                | -.003 | .166 |  | .103 |
| 15.0                        | .010               | .845  | .027                | .012  | 105.0          | .041               | -.257 | .028                | -.004 | .167 |  | .102 |
| 20.0                        | .012               | .805  | .042                | .012  | 110.0          | .040               | -.320 | .027                | -.004 | .167 |  | .101 |
| 25.0                        | .014               | .775  | .062                | .011  | 115.0          | .040               | -.362 | .025                | -.004 | .166 |  | .112 |
| 30.0                        | .017               | .775  | .080                | .011  | 120.0          | .039               | -.436 | .022                | -.004 | .167 |  | .104 |
| 35.0                        | .020               | .675  | .077                | .009  | 125.0          | .037               | -.483 | .019                | -.004 | .167 |  | .102 |
| 40.0                        | .025               | .635  | .065                | .008  | 130.0          | .035               | -.431 | .014                | -.004 | .166 |  | .102 |
| 45.0                        | .029               | .564  | .050                | .005  | 135.0          | .033               | -.400 | .007                | -.003 | .165 |  | .105 |
| 50.0                        | .038               | .534  | .044                | .004  | 140.0          | .031               | -.412 | -.005               | -.003 | .164 |  | .102 |
| 55.0                        | .039               | .474  | .039                | .002  | 145.0          | .028               | -.443 | -.017               | -.003 | .166 |  | .106 |
| 60.0                        | .040               | .404  | .035                | .001  | 150.0          | .026               | -.482 | -.024               | -.002 | .168 |  | .106 |
| 65.0                        | .041               | .331  | .033                | .000  | 155.0          | .022               | -.492 | -.020               | -.001 | .172 |  | .106 |
| 70.0                        | .042               | .263  | .033                | -.001 | 160.0          | .018               | -.503 | -.013               | .000  | .176 |  | .103 |
| 75.0                        | .042               | .203  | .033                | -.001 | 165.0          | .013               | -.513 | -.008               | .000  | .179 |  | .106 |
| 80.0                        | .042               | .122  | .033                | -.002 | 170.0          | .007               | -.511 | -.005               | .001  | .180 |  | .105 |
| 85.0                        | .042               | .102  | .032                | -.002 | 175.0          | .001               | -.512 | -.002               | -.001 | .179 |  | .104 |
| 90.0                        | .043               | .122  | .031                | -.003 | 180.0          | -.005              | -.521 | -.001               | -.001 | .177 |  | .105 |

Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 80.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  |
|----------------|------------------------------|-------|------|------------------------------|------|------|----------------|------------------------------|-------|------|------------------------------|------|------|
| 0              | .003                         | .567  | .157 | .008                         | .012 | .086 | 90.0           | .028                         | .088  | .163 | .020                         | .000 | .110 |
| 5.0            | .003                         | .544  | .155 | .011                         | .013 | .088 | 95.0           | .027                         | -.059 | .164 | .020                         | .000 | .110 |
| 10.0           | .005                         | .561  | .153 | .015                         | .012 | .091 | 100.0          | .028                         | -.114 | .165 | .020                         | .000 | .111 |
| 15.0           | .007                         | .557  | .150 | .020                         | .012 | .093 | 105.0          | .028                         | -.162 | .166 | .020                         | .000 | .111 |
| 20.0           | .008                         | .532  | .144 | .030                         | .012 | .095 | 110.0          | .027                         | -.205 | .166 | .017                         | .000 | .110 |
| 25.0           | .009                         | .514  | .146 | .043                         | .011 | .098 | 115.0          | .027                         | -.246 | .165 | .016                         | .000 | .118 |
| 30.0           | .010                         | .515  | .145 | .055                         | .011 | .100 | 120.0          | .027                         | -.283 | .168 | .014                         | .000 | .112 |
| 35.0           | .012                         | .450  | .146 | .052                         | .010 | .103 | 125.0          | .025                         | -.315 | .168 | .011                         | .000 | .111 |
| 40.0           | .015                         | .425  | .148 | .044                         | .009 | .104 | 130.0          | .024                         | -.279 | .169 | .008                         | .000 | .111 |
| 45.0           | .018                         | .394  | .152 | .034                         | .007 | .105 | 135.0          | .022                         | -.259 | .169 | .003                         | .001 | .113 |
| 50.0           | .024                         | .360  | .155 | .030                         | .006 | .107 | 140.0          | .021                         | -.270 | .169 | -.004                        | .001 | .111 |
| 55.0           | .025                         | .323  | .157 | .026                         | .004 | .107 | 145.0          | .019                         | -.290 | .172 | -.013                        | .001 | .114 |
| 60.0           | .025                         | .278  | .159 | .023                         | .003 | .108 | 150.0          | .017                         | -.315 | .174 | -.018                        | .002 | .114 |
| 65.0           | .026                         | .229  | .159 | .022                         | .002 | .107 | 155.0          | .014                         | -.328 | .177 | -.016                        | .003 | .113 |
| 70.0           | .027                         | .182  | .160 | .022                         | .001 | .109 | 160.0          | .011                         | -.335 | .180 | -.011                        | .004 | .111 |
| 75.0           | .027                         | .142  | .160 | .022                         | .001 | .109 | 165.0          | .007                         | -.345 | .184 | -.008                        | .004 | .113 |
| 80.0           | .027                         | .088  | .161 | .022                         | .000 | .110 | 170.0          | .003                         | -.344 | .185 | -.007                        | .005 | .113 |
| 85.0           | .027                         | .075  | .162 | .021                         | .000 | .111 | 175.0          | -.001                        | -.348 | .186 | -.005                        | .005 | .112 |
| 90.0           | .028                         | .088  | .163 | .020                         | .000 | .110 | 180.0          | -.005                        | -.360 | .185 | -.005                        | .005 | .113 |

\*\*\*AZIMUTH ANGLE = 85.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  |
|----------------|------------------------------|-------|------|------------------------------|------|------|----------------|------------------------------|-------|------|------------------------------|------|------|
| 0              | .004                         | .260  | .179 | .011                         | .012 | .108 | 90.0           | .014                         | .054  | .162 | .010                         | .001 | .119 |
| 5.0            | .003                         | .253  | .175 | .011                         | .013 | .109 | 95.0           | .014                         | -.015 | .164 | .010                         | .002 | .119 |
| 10.0           | .003                         | .268  | .171 | .012                         | .012 | .111 | 100.0          | .015                         | -.046 | .165 | .010                         | .002 | .120 |
| 15.0           | .004                         | .269  | .167 | .013                         | .012 | .111 | 105.0          | .015                         | -.068 | .165 | .009                         | .002 | .120 |
| 20.0           | .004                         | .254  | .157 | .018                         | .012 | .112 | 110.0          | .014                         | -.091 | .165 | .008                         | .003 | .119 |
| 25.0           | .004                         | .253  | .163 | .024                         | .011 | .113 | 115.0          | .015                         | -.110 | .165 | .007                         | .003 | .124 |
| 30.0           | .004                         | .256  | .160 | .030                         | .011 | .114 | 120.0          | .015                         | -.131 | .169 | .006                         | .004 | .121 |
| 35.0           | .005                         | .225  | .158 | .028                         | .011 | .116 | 125.0          | .014                         | -.147 | .170 | .004                         | .004 | .120 |
| 40.0           | .006                         | .216  | .159 | .023                         | .010 | .117 | 130.0          | .013                         | -.127 | .172 | .003                         | .005 | .120 |
| 45.0           | .007                         | .205  | .161 | .018                         | .009 | .117 | 135.0          | .012                         | -.119 | .173 | .000                         | .005 | .121 |
| 50.0           | .010                         | .186  | .161 | .016                         | .008 | .119 | 140.0          | .011                         | -.128 | .175 | -.004                        | .006 | .120 |
| 55.0           | .011                         | .172  | .161 | .014                         | .006 | .118 | 145.0          | .010                         | -.137 | .178 | -.009                        | .006 | .122 |
| 60.0           | .010                         | .152  | .162 | .012                         | .005 | .119 | 150.0          | .008                         | -.148 | .180 | -.012                        | .007 | .121 |
| 65.0           | .011                         | .127  | .160 | .011                         | .005 | .118 | 155.0          | .006                         | -.164 | .182 | -.009                        | .007 | .121 |
| 70.0           | .012                         | .101  | .160 | .011                         | .004 | .119 | 160.0          | .004                         | -.167 | .185 | -.009                        | .008 | .120 |
| 75.0           | .012                         | .081  | .160 | .011                         | .003 | .119 | 165.0          | .002                         | -.177 | .189 | -.009                        | .008 | .121 |
| 80.0           | .013                         | .054  | .160 | .011                         | .002 | .119 | 170.0          | .000                         | -.177 | .190 | -.010                        | .009 | .121 |
| 85.0           | .013                         | .048  | .162 | .010                         | .002 | .120 | 175.0          | -.003                        | -.184 | .193 | -.009                        | .009 | .120 |
| 90.0           | .014                         | .054  | .162 | .010                         | .001 | .119 | 180.0          | -.005                        | -.200 | .193 | -.010                        | .009 | .122 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 90.0**** |                 |                |      |                 |      |      |                |                 |                |      |                 |      |      |
|-----------------------------|-----------------|----------------|------|-----------------|------|------|----------------|-----------------|----------------|------|-----------------|------|------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE | MOMENT<br>PITCH | ROLL | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE | MOMENT<br>PITCH | ROLL | YAW  |
| 0                           | .005            | -.047          | .201 | .015            | .012 | .130 | 90.0           | .000            | .021           | .162 | .000            | .004 | .128 |
| 5.0                         | .004            | -.037          | .195 | .012            | .013 | .131 | 95.0           | .001            | .029           | .164 | .000            | .005 | .128 |
| 10.0                        | .002            | -.025          | .190 | .010            | .012 | .131 | 100.0          | .002            | .021           | .165 | .000            | .005 | .129 |
| 15.0                        | .001            | -.019          | .185 | .007            | .012 | .130 | 105.0          | .002            | .026           | .165 | .000            | .006 | .129 |
| 20.0                        | .000            | -.014          | .170 | .007            | .012 | .129 | 110.0          | .002            | .023           | .165 | .001            | .007 | .129 |
| 25.0                        | .001            | -.008          | .180 | .005            | .012 | .129 | 115.0          | .003            | .026           | .165 | .001            | .007 | .130 |
| 30.0                        | .002            | -.003          | .175 | .005            | .012 | .129 | 120.0          | .003            | .021           | .170 | .001            | .008 | .130 |
| 35.0                        | .002            | .001           | .170 | .004            | .012 | .130 | 125.0          | .003            | .020           | .172 | .003            | .009 | .130 |
| 40.0                        | .003            | .007           | .170 | .003            | .011 | .130 | 130.0          | .003            | .024           | .175 | .002            | .010 | .130 |
| 45.0                        | .003            | .016           | .170 | .002            | .011 | .129 | 135.0          | .002            | .021           | .178 | .003            | .010 | .130 |
| 50.0                        | .003            | .012           | .168 | .002            | .010 | .130 | 140.0          | .002            | .013           | .181 | .004            | .011 | .130 |
| 55.0                        | .003            | .022           | .165 | .002            | .009 | .130 | 145.0          | .001            | .016           | .185 | .005            | .011 | .130 |
| 60.0                        | .004            | .026           | .165 | .001            | .008 | .130 | 150.0          | .000            | .019           | .186 | .006            | .012 | .129 |
| 65.0                        | .003            | .025           | .161 | .001            | .008 | .129 | 155.0          | .001            | .000           | .188 | .007            | .012 | .129 |
| 70.0                        | .002            | .021           | .160 | .001            | .007 | .129 | 160.0          | .002            | .000           | .190 | .008            | .012 | .129 |
| 75.0                        | .002            | .021           | .160 | .000            | .006 | .129 | 165.0          | .003            | .010           | .194 | .010            | .012 | .129 |
| 80.0                        | .001            | .021           | .160 | .000            | .005 | .129 | 170.0          | .004            | .010           | .196 | .013            | .013 | .130 |
| 85.0                        | .001            | .021           | .162 | .000            | .005 | .129 | 175.0          | .005            | .020           | .200 | .013            | .013 | .128 |
| 90.0                        | .000            | .021           | .162 | .000            | .004 | .128 | 180.0          | .006            | .040           | .201 | .015            | .013 | .131 |

| ***AZIMUTH ANGLE = 95.0**** |                 |                |      |                 |      |      |                |                 |                |      |                 |      |      |
|-----------------------------|-----------------|----------------|------|-----------------|------|------|----------------|-----------------|----------------|------|-----------------|------|------|
| ELEV.<br>ANGLE              | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE | MOMENT<br>PITCH | ROLL | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | SIDE | MOMENT<br>PITCH | ROLL | YAW  |
| 0                           | .005            | -.205          | .193 | .010            | .008 | .121 | 90.0           | -.014           | .056           | .162 | .010            | .001 | .119 |
| 5.0                         | .002            | -.195          | .189 | .008            | .009 | .122 | 95.0           | -.013           | .053           | .163 | .010            | .002 | .119 |
| 10.0                        | .001            | -.188          | .186 | .008            | .008 | .122 | 100.0          | -.012           | .056           | .164 | .011            | .002 | .119 |
| 15.0                        | .003            | -.183          | .183 | .007            | .008 | .122 | 105.0          | -.012           | .085           | .163 | .011            | .003 | .120 |
| 20.0                        | .006            | -.176          | .172 | .009            | .008 | .120 | 110.0          | -.012           | .105           | .163 | .011            | .004 | .119 |
| 25.0                        | .008            | -.169          | .177 | .012            | .007 | .121 | 115.0          | -.011           | .127           | .162 | .011            | .004 | .119 |
| 30.0                        | .010            | -.162          | .172 | .011            | .007 | .121 | 120.0          | -.011           | .147           | .165 | .012            | .005 | .119 |
| 35.0                        | .012            | -.146          | .168 | .008            | .007 | .122 | 125.0          | -.011           | .173           | .165 | .015            | .006 | .118 |
| 40.0                        | .012            | -.133          | .168 | .003            | .006 | .120 | 130.0          | -.010           | .194           | .166 | .016            | .008 | .119 |
| 45.0                        | .013            | -.123          | .168 | .001            | .006 | .121 | 135.0          | -.008           | .208           | .166 | .018            | .008 | .118 |
| 50.0                        | .013            | -.117          | .167 | .003            | .005 | .120 | 140.0          | -.007           | .218           | .166 | .024            | .010 | .117 |
| 55.0                        | .014            | -.148          | .165 | .005            | .004 | .120 | 145.0          | -.006           | .234           | .168 | .029            | .010 | .116 |
| 60.0                        | .015            | -.126          | .165 | .006            | .004 | .121 | 150.0          | -.005           | .269           | .167 | .030            | .011 | .114 |
| 65.0                        | .015            | -.110          | .162 | .007            | .004 | .123 | 155.0          | -.005           | .257           | .168 | .025            | .011 | .113 |
| 70.0                        | .014            | -.095          | .162 | .008            | .003 | .119 | 160.0          | -.005           | .266           | .170 | .019            | .012 | .112 |
| 75.0                        | .015            | -.070          | .162 | .009            | .002 | .120 | 165.0          | -.005           | .274           | .173 | .015            | .012 | .111 |
| 80.0                        | .014            | -.047          | .162 | .010            | .002 | .120 | 170.0          | -.005           | .277           | .175 | .014            | .012 | .110 |
| 85.0                        | .014            | -.021          | .163 | .010            | .002 | .120 | 175.0          | -.004           | .263           | .178 | .012            | .013 | .107 |
| 90.0                        | .014            | .056           | .162 | .010            | .001 | .119 | 180.0          | -.004           | .264           | .179 | .011            | .013 | .108 |

Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 100.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL | PITCH               | ROLL |
| 0              | .005               | -.363 | .185                | .113 | 90.0           | -.028              | .091  | -.020               | .000 | -.020               | .000 |
| 5.0            | .000               | -.353 | .184                | .113 | 95.0           | -.027              | .078  | -.021               | .000 | -.021               | .000 |
| 10.0           | -.004              | -.352 | .183                | .113 | 100.0          | -.027              | .091  | -.022               | .000 | -.022               | .000 |
| 15.0           | -.008              | -.347 | .181                | .114 | 105.0          | -.027              | .144  | -.022               | .001 | -.022               | .001 |
| 20.0           | -.012              | -.339 | .174                | .111 | 110.0          | -.027              | .187  | -.022               | .001 | -.022               | .001 |
| 25.0           | -.015              | -.330 | .174                | .113 | 115.0          | -.026              | .115  | -.022               | .002 | -.022               | .002 |
| 30.0           | -.018              | -.321 | .170                | .114 | 120.0          | -.025              | .273  | -.023               | .003 | -.023               | .003 |
| 35.0           | -.019              | -.293 | .167                | .114 | 125.0          | -.025              | .326  | -.027               | .004 | -.027               | .004 |
| 40.0           | -.021              | -.273 | .166                | .111 | 130.0          | -.024              | .365  | -.030               | .006 | -.030               | .006 |
| 45.0           | -.023              | -.262 | .166                | .113 | 135.0          | -.018              | .395  | -.034               | .006 | -.034               | .006 |
| 50.0           | -.024              | -.286 | .166                | .111 | 140.0          | -.016              | .424  | -.044               | .009 | -.044               | .009 |
| 55.0           | -.025              | -.318 | .166                | .111 | 145.0          | -.013              | .452  | -.053               | .009 | -.053               | .009 |
| 60.0           | -.027              | -.279 | .166                | .112 | 150.0          | -.011              | .519  | -.055               | .011 | -.055               | .011 |
| 65.0           | -.027              | -.245 | .164                | .117 | 155.0          | -.009              | .514  | -.043               | .011 | -.043               | .011 |
| 70.0           | -.027              | -.211 | .164                | .110 | 160.0          | -.008              | .533  | -.030               | .012 | -.030               | .012 |
| 75.0           | -.028              | -.162 | .164                | .111 | 165.0          | -.007              | .559  | -.021               | .012 | -.021               | .012 |
| 80.0           | -.028              | -.115 | .164                | .111 | 170.0          | -.006              | .564  | -.016               | .012 | -.016               | .012 |
| 85.0           | -.027              | -.063 | .164                | .111 | 175.0          | -.003              | .547  | -.011               | .013 | -.011               | .013 |
| 90.0           | -.028              | -.091 | .163                | .110 | 180.0          | -.003              | .568  | -.008               | .013 | -.008               | .013 |

\*\*\*AZIMUTH ANGLE = 105.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | .005               | -.521 | .177                | .105 | 90.0           | -.043              | .126  | -.031               | -.003 | -.031               | -.003 |
| 5.0            | -.001              | -.511 | .179                | .104 | 95.0           | -.042              | .103  | -.032               | -.002 | -.032               | -.002 |
| 10.0           | -.007              | -.516 | .180                | .105 | 100.0          | -.042              | .126  | -.033               | -.002 | -.033               | -.002 |
| 15.0           | -.013              | -.511 | .179                | .106 | 105.0          | -.042              | .203  | -.033               | -.001 | -.033               | -.001 |
| 20.0           | -.018              | -.502 | .176                | .103 | 110.0          | -.042              | .269  | -.033               | -.001 | -.033               | -.001 |
| 25.0           | -.022              | -.491 | .172                | .106 | 115.0          | -.041              | .331  | -.033               | .000  | -.033               | .000  |
| 30.0           | -.026              | -.481 | .168                | .132 | 120.0          | -.040              | .400  | -.035               | .001  | -.035               | .001  |
| 35.0           | -.028              | -.441 | .166                | .106 | 125.0          | -.039              | .479  | -.039               | .002  | -.039               | .002  |
| 40.0           | -.031              | -.413 | .164                | .102 | 130.0          | -.038              | .536  | -.044               | .004  | -.044               | .004  |
| 45.0           | -.033              | -.401 | .165                | .105 | 135.0          | -.029              | .582  | -.050               | .005  | -.050               | .005  |
| 50.0           | -.035              | -.436 | .166                | .102 | 140.0          | -.025              | .630  | -.065               | .008  | -.065               | .008  |
| 55.0           | -.037              | -.488 | .167                | .102 | 145.0          | -.020              | .671  | -.077               | .009  | -.077               | .009  |
| 60.0           | -.039              | -.432 | .167                | .104 | 150.0          | -.017              | .770  | -.080               | .011  | -.080               | .011  |
| 65.0           | -.040              | -.381 | .166                | .112 | 155.0          | -.014              | .771  | -.062               | .011  | -.062               | .011  |
| 70.0           | -.040              | -.328 | .167                | .101 | 160.0          | -.012              | .800  | -.042               | .012  | -.042               | .012  |
| 75.0           | -.041              | -.254 | .167                | .102 | 165.0          | -.007              | .844  | -.027               | .012  | -.027               | .012  |
| 80.0           | -.042              | -.183 | .166                | .103 | 170.0          | -.003              | .852  | -.018               | .013  | -.018               | .013  |
| 85.0           | -.041              | -.106 | .165                | .102 | 175.0          | -.003              | .831  | -.011               | .013  | -.011               | .013  |
| 90.0           | -.043              | .126  | .164                | .102 | 180.0          | -.002              | .872  | -.005               | .013  | -.005               | .013  |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 110.0*** |                    |       |      |                     |       |      |                |                    |       |      |                     |       |      |
|-----------------------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|                             | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| 0                           | .009               | -.401 | .196 | .001                | -.001 | .118 | 90.0           | -.056              | .101  | .159 | -.042               | -.001 | .101 |
| 5.0                         | .000               | -.394 | .197 | .002                | -.001 | .117 | 95.0           | -.055              | .123  | .158 | -.044               | -.001 | .101 |
| 10.0                        | -.010              | -.399 | .197 | .003                | -.001 | .116 | 100.0          | -.055              | .175  | .156 | -.045               | -.001 | .100 |
| 15.0                        | -.019              | -.391 | .195 | .004                | -.001 | .117 | 105.0          | -.054              | .265  | .154 | -.045               | .000  | .096 |
| 20.0                        | -.026              | -.379 | .190 | .006                | -.001 | .116 | 110.0          | -.052              | .358  | .151 | -.045               | .000  | .095 |
| 25.0                        | -.031              | -.368 | .186 | .010                | -.001 | .115 | 115.0          | -.051              | .444  | .148 | -.044               | .000  | .088 |
| 30.0                        | -.036              | -.361 | .179 | .012                | -.001 | .115 | 120.0          | -.045              | .533  | .144 | -.043               | .001  | .088 |
| 35.0                        | -.038              | -.378 | .177 | .006                | -.001 | .113 | 125.0          | -.041              | .628  | .135 | -.046               | .003  | .084 |
| 40.0                        | -.042              | -.417 | .171 | .003                | -.001 | .109 | 130.0          | -.036              | .704  | .124 | -.050               | .003  | .080 |
| 45.0                        | -.044              | -.445 | .170 | .013                | .000  | .110 | 135.0          | -.026              | .774  | .112 | -.057               | .007  | .074 |
| 50.0                        | -.046              | -.476 | .166 | .017                | .000  | .106 | 140.0          | -.019              | .847  | .102 | -.070               | .011  | .069 |
| 55.0                        | -.049              | -.500 | .164 | .024                | -.001 | .105 | 145.0          | -.012              | .918  | .092 | -.080               | .013  | .065 |
| 60.0                        | -.051              | -.454 | .163 | .028                | -.001 | .103 | 150.0          | -.008              | 1.024 | .077 | -.083               | .014  | .054 |
| 65.0                        | -.053              | -.398 | .161 | .031                | -.002 | .111 | 155.0          | -.007              | 1.051 | .076 | -.071               | .014  | .047 |
| 70.0                        | -.054              | -.334 | .161 | .034                | -.002 | .103 | 160.0          | -.009              | 1.088 | .071 | -.057               | .014  | .039 |
| 75.0                        | -.055              | -.256 | .161 | .036                | -.002 | .103 | 165.0          | -.012              | 1.119 | .067 | -.047               | .014  | .033 |
| 80.0                        | -.056              | -.186 | .159 | .039                | -.001 | .102 | 170.0          | -.016              | 1.118 | .067 | -.044               | .014  | .025 |
| 85.0                        | -.055              | -.093 | .160 | .041                | -.001 | .102 | 175.0          | -.022              | 1.098 | .065 | -.045               | .014  | .023 |
| 90.0                        | -.056              | .101  | .159 | .042                | -.001 | .101 | 180.0          | -.029              | 1.108 | .065 | -.046               | .014  | .017 |

| ***AZIMUTH ANGLE = 115.0*** |                    |       |      |                     |       |      |                |                    |       |       |                     |      |       |
|-----------------------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|-------|---------------------|------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |       | MOMENT COEFFICIENTS |      |       |
|                             | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE  | PITCH               | ROLL | YAW   |
| 0                           | .014               | -.282 | .215 | .001                | -.003 | .131 | 90.0           | -.070              | .077  | .154  | -.053               | .000 | .100  |
| 5.0                         | .000               | -.278 | .216 | .002                | -.003 | .131 | 95.0           | -.069              | .143  | .153  | -.056               | .000 | .100  |
| 10.0                        | -.013              | -.282 | .214 | .001                | -.003 | .128 | 100.0          | -.068              | .224  | .150  | -.057               | .000 | .099  |
| 15.0                        | -.025              | -.271 | .211 | .001                | -.003 | .128 | 105.0          | -.066              | .327  | .148  | -.058               | .000 | .104  |
| 20.0                        | -.034              | -.256 | .205 | .000                | -.003 | .129 | 110.0          | -.062              | .447  | .143  | -.057               | .001 | .090  |
| 25.0                        | -.040              | -.245 | .200 | .012                | -.002 | .125 | 115.0          | -.062              | .557  | .138  | -.055               | .001 | .079  |
| 30.0                        | -.046              | -.242 | .190 | .000                | -.001 | .132 | 120.0          | -.050              | .666  | .132  | -.052               | .002 | .079  |
| 35.0                        | -.049              | -.315 | .189 | .005                | .000  | .120 | 125.0          | -.043              | .778  | .117  | -.053               | .004 | .072  |
| 40.0                        | -.053              | -.421 | .178 | .011                | .001  | .117 | 130.0          | -.034              | .872  | .099  | -.057               | .003 | .058  |
| 45.0                        | -.055              | -.489 | .175 | .019                | .003  | .115 | 135.0          | -.023              | .967  | .081  | -.064               | .010 | .054  |
| 50.0                        | -.058              | -.517 | .167 | .021                | .003  | .111 | 140.0          | -.014              | 1.065 | .066  | -.075               | .014 | .047  |
| 55.0                        | -.061              | -.513 | .162 | .029                | .002  | .108 | 145.0          | -.005              | 1.165 | .051  | -.083               | .017 | .040  |
| 60.0                        | -.064              | -.476 | .159 | .034                | .000  | .102 | 150.0          | .000               | 1.278 | .023  | -.086               | .018 | .022  |
| 65.0                        | -.066              | -.415 | .156 | .038                | .000  | .110 | 155.0          | .000               | 1.331 | .023  | -.080               | .017 | .011  |
| 70.0                        | -.068              | -.340 | .155 | .045                | .000  | .105 | 160.0          | -.006              | 1.376 | .011  | -.072               | .017 | .000  |
| 75.0                        | -.069              | -.259 | .155 | .045                | .000  | .104 | 165.0          | -.014              | 1.394 | .001  | -.068               | .016 | -.008 |
| 80.0                        | -.070              | -.189 | .152 | .048                | .000  | .102 | 170.0          | -.025              | 1.384 | -.001 | -.071               | .016 | -.019 |
| 85.0                        | -.069              | -.080 | .155 | .051                | .000  | .102 | 175.0          | -.041              | 1.365 | -.004 | -.079               | .016 | -.021 |
| 90.0                        | -.070              | .077  | .154 | .053                | .000  | .100 | 180.0          | -.057              | 1.344 | -.005 | -.088               | .016 | -.028 |

Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 120.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL |
| 0              | .019               | -.163 | .235                | .145 | 90.0           | -.084              | .053  | .150                | .100 | -.065               | .002 |
| 5.0            | .000               | -.162 | .235                | .145 | 95.0           | -.083              | .163  | .148                | .100 | -.069               | .001 |
| 10.0           | -.016              | -.165 | .232                | .140 | 100.0          | -.081              | .273  | .145                | .098 | -.070               | .001 |
| 15.0           | -.032              | -.152 | .228                | .140 | 105.0          | -.078              | .390  | .142                | .090 | -.071               | .001 |
| 20.0           | -.042              | -.134 | .220                | .143 | 110.0          | -.073              | .536  | .135                | .085 | -.069               | .002 |
| 25.0           | -.050              | -.122 | .215                | .135 | 115.0          | -.073              | .670  | .129                | .070 | -.066               | .002 |
| 30.0           | -.056              | -.123 | .201                | .132 | 120.0          | -.056              | .800  | .120                | .070 | -.061               | .003 |
| 35.0           | -.060              | -.253 | .201                | .128 | 125.0          | -.045              | .928  | .100                | .060 | -.060               | .006 |
| 40.0           | -.064              | -.426 | .185                | .125 | 130.0          | -.033              | 1.040 | .075                | .050 | -.064               | .003 |
| 45.0           | -.067              | -.533 | .180                | .120 | 135.0          | -.020              | 1.160 | .050                | .035 | -.071               | .013 |
| 50.0           | -.070              | -.558 | .168                | .116 | 140.0          | -.009              | 1.283 | .030                | .025 | -.081               | .018 |
| 55.0           | -.073              | -.526 | .160                | .111 | 145.0          | .002               | 1.412 | .010                | .015 | -.087               | .021 |
| 60.0           | -.077              | -.499 | .155                | .102 | 150.0          | .008               | 1.533 | .030                | .010 | -.090               | .022 |
| 65.0           | -.079              | -.432 | .151                | .109 | 155.0          | .006               | 1.612 | .030                | .025 | -.090               | .021 |
| 70.0           | -.082              | -.346 | .150                | .107 | 160.0          | -.004              | 1.665 | .049                | .040 | -.087               | .020 |
| 75.0           | -.084              | -.262 | .150                | .105 | 165.0          | -.017              | 1.670 | .069                | .050 | -.089               | .018 |
| 80.0           | -.084              | -.192 | .145                | .102 | 170.0          | -.035              | 1.651 | .069                | .065 | -.098               | .018 |
| 85.0           | -.084              | -.068 | .150                | .102 | 175.0          | -.060              | 1.633 | .075                | .065 | -.114               | .018 |
| 90.0           | -.084              | .053  | .150                | .100 | 180.0          | -.085              | 1.581 | .076                | .075 | -.130               | .018 |

\*\*\*AZIMUTH ANGLE = 125.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL |
| 0              | .014               | -.310 | .223                | .140 | 90.0           | -.091              | .000  | .141                | .093 | -.075               | .001 |
| 5.0            | -.007              | -.302 | .222                | .139 | 95.0           | -.090              | .142  | .136                | .089 | -.078               | .000 |
| 10.0           | -.024              | -.284 | .220                | .136 | 100.0          | -.090              | .282  | .131                | .087 | -.079               | .000 |
| 15.0           | -.040              | -.272 | .217                | .136 | 105.0          | -.087              | .436  | .124                | .080 | -.079               | .000 |
| 20.0           | -.052              | -.251 | .212                | .137 | 110.0          | -.079              | .638  | .116                | .074 | -.075               | .001 |
| 25.0           | -.061              | -.215 | .207                | .131 | 115.0          | -.072              | .813  | .105                | .060 | -.069               | .002 |
| 30.0           | -.069              | -.199 | .197                | .128 | 120.0          | -.055              | .960  | .093                | .056 | -.062               | .004 |
| 35.0           | -.074              | -.264 | .196                | .124 | 125.0          | -.042              | 1.085 | .073                | .043 | -.060               | .006 |
| 40.0           | -.079              | -.351 | .184                | .121 | 130.0          | -.029              | 1.193 | .047                | .027 | -.063               | .003 |
| 45.0           | -.083              | -.422 | .178                | .116 | 135.0          | -.017              | 1.300 | .021                | .010 | -.068               | .010 |
| 50.0           | -.085              | -.474 | .166                | .118 | 140.0          | -.007              | 1.368 | .004                | .003 | -.076               | .013 |
| 55.0           | -.087              | -.494 | .156                | .108 | 145.0          | .002               | 1.479 | .013                | .003 | -.081               | .014 |
| 60.0           | -.090              | -.518 | .150                | .101 | 150.0          | .008               | 1.563 | .043                | .015 | -.083               | .015 |
| 65.0           | -.090              | -.485 | .145                | .104 | 155.0          | .008               | 1.612 | .045                | .042 | -.082               | .014 |
| 70.0           | -.092              | -.405 | .145                | .102 | 160.0          | .002               | 1.643 | .057                | .048 | -.077               | .014 |
| 75.0           | -.091              | -.341 | .144                | .100 | 165.0          | -.005              | 1.646 | .064                | .051 | -.077               | .014 |
| 80.0           | -.091              | -.263 | .140                | .097 | 170.0          | -.016              | 1.631 | .066                | .059 | -.081               | .015 |
| 85.0           | -.091              | -.140 | .143                | .096 | 175.0          | -.033              | 1.606 | .069                | .058 | -.090               | .013 |
| 90.0           | -.091              | .000  | .141                | .093 | 180.0          | -.049              | 1.558 | .070                | .068 | -.098               | .018 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 130.0**** |                 |                |               |                 |                |               |                |                 |                |               |                 |                |               |
|------------------------------|-----------------|----------------|---------------|-----------------|----------------|---------------|----------------|-----------------|----------------|---------------|-----------------|----------------|---------------|
| ELEV.<br>ANGLE               | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
| 0                            | .010            | -.457          | .211          | -.006           | -.001          | .135          | 90.0           | -.098           | -.053          | .132          | -.086           | .000           | .086          |
| 5.0                          | -.014           | -.442          | .209          | -.000           | .000           | .134          | 95.0           | -.098           | .122           | .124          | -.088           | .000           | .078          |
| 10.0                         | -.032           | -.404          | .208          | -.004           | .000           | .132          | 100.0          | -.099           | .292           | .118          | -.088           | .000           | .077          |
| 15.0                         | -.048           | -.392          | .207          | -.010           | .001           | .132          | 105.0          | -.096           | .482           | .107          | -.087           | .000           | .070          |
| 20.0                         | -.062           | -.368          | .204          | -.015           | .002           | .132          | 110.0          | -.085           | .741           | .097          | -.081           | .001           | .063          |
| 25.0                         | -.072           | -.304          | .200          | -.021           | .003           | .128          | 115.0          | -.072           | .956           | .082          | -.072           | .003           | .051          |
| 30.0                         | -.082           | -.275          | .194          | -.027           | .003           | .124          | 120.0          | -.054           | 1.121          | .066          | -.064           | .005           | .042          |
| 35.0                         | -.089           | -.275          | .192          | -.036           | .001           | .121          | 125.0          | -.039           | 1.242          | .046          | -.060           | .006           | .026          |
| 40.0                         | -.095           | -.276          | .183          | -.049           | .000           | .117          | 130.0          | -.025           | 1.346          | .019          | -.062           | .004           | .005          |
| 45.0                         | -.099           | -.311          | .176          | -.056           | .000           | .112          | 135.0          | -.015           | 1.440          | .006          | -.065           | .007           | -.013         |
| 50.0                         | -.101           | -.390          | .164          | -.059           | .001           | .109          | 140.0          | -.006           | 1.494          | .008          | -.071           | .008           | -.031         |
| 55.0                         | -.102           | -.463          | .153          | -.063           | .002           | .105          | 145.0          | .002            | 1.546          | .036          | -.075           | .008           | -.045         |
| 60.0                         | -.103           | -.537          | .145          | -.068           | .003           | .100          | 150.0          | .008            | 1.594          | .056          | -.076           | .008           | -.058         |
| 65.0                         | -.102           | -.539          | .140          | -.073           | .002           | .100          | 155.0          | .010            | 1.613          | .060          | -.074           | .004           | -.059         |
| 70.0                         | -.101           | -.464          | .140          | -.077           | .002           | .098          | 160.0          | .009            | 1.621          | .066          | -.069           | .009           | -.057         |
| 75.0                         | -.100           | -.420          | .139          | -.082           | .000           | .095          | 165.0          | .006            | 1.623          | .064          | -.066           | .010           | -.053         |
| 80.0                         | -.098           | -.334          | .136          | -.084           | .000           | .093          | 170.0          | .001            | 1.611          | .063          | -.064           | .012           | -.053         |
| 85.0                         | -.098           | -.212          | .136          | -.086           | .000           | .090          | 175.0          | -.006           | 1.579          | .064          | -.066           | .008           | -.051         |
| 90.0                         | -.098           | -.053          | .132          | -.086           | .000           | .086          | 180.0          | -.014           | 1.535          | .064          | -.066           | .018           | -.061         |

| ***AZIMUTH ANGLE = 135.0**** |                 |                |               |                 |                |               |                |                 |                |               |                 |                |               |
|------------------------------|-----------------|----------------|---------------|-----------------|----------------|---------------|----------------|-----------------|----------------|---------------|-----------------|----------------|---------------|
| ELEV.<br>ANGLE               | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE<br>SIDE | MOMENT<br>PITCH | MOMENT<br>ROLL | MOMENT<br>YAW |
| 0                            | .006            | -.605          | .200          | -.008           | .001           | .130          | 90.0           | -.105           | -.107          | .124          | -.097           | -.001          | .080          |
| 5.0                          | -.021           | -.583          | .197          | -.000           | .003           | .129          | 95.0           | -.106           | .102           | .112          | -.098           | -.001          | .067          |
| 10.0                         | -.041           | -.524          | .197          | -.006           | .004           | .129          | 100.0          | -.108           | .302           | .105          | -.098           | .001           | .067          |
| 15.0                         | -.057           | -.513          | .197          | -.014           | .005           | .128          | 105.0          | -.105           | .528           | .090          | -.096           | .000           | .060          |
| 20.0                         | -.072           | -.486          | .196          | -.029           | .006           | .127          | 110.0          | -.092           | .844           | .079          | -.087           | .001           | .052          |
| 25.0                         | -.084           | -.403          | .193          | -.027           | .007           | .125          | 115.0          | -.072           | 1.100          | .059          | -.076           | .004           | .042          |
| 30.0                         | -.095           | -.352          | .191          | -.035           | .005           | .121          | 120.0          | -.053           | 1.282          | .039          | -.066           | .006           | .029          |
| 35.0                         | -.104           | -.287          | .188          | -.047           | .001           | .118          | 125.0          | -.037           | 1.400          | .019          | -.061           | .007           | .010          |
| 40.0                         | -.111           | -.202          | .182          | -.063           | -.002          | .114          | 130.0          | -.022           | 1.500          | .009          | -.061           | .005           | -.017         |
| 45.0                         | -.115           | -.201          | .175          | -.072           | -.003          | .109          | 135.0          | -.013           | 1.580          | .035          | -.062           | .004           | -.038         |
| 50.0                         | -.117           | -.307          | .162          | -.076           | -.002          | .105          | 140.0          | -.005           | 1.600          | .048          | -.066           | .003           | -.060         |
| 55.0                         | -.117           | -.432          | .150          | -.078           | .001           | .102          | 145.0          | .002            | 1.613          | .060          | -.070           | .002           | -.076         |
| 60.0                         | -.116           | -.556          | .140          | -.083           | .003           | .099          | 150.0          | .008            | 1.625          | .070          | -.070           | .001           | -.082         |
| 65.0                         | -.114           | -.593          | .135          | -.088           | .003           | .096          | 155.0          | .012            | 1.614          | .075          | -.067           | .002           | -.077         |
| 70.0                         | -.111           | -.524          | .135          | -.091           | .002           | .094          | 160.0          | .016            | 1.600          | .075          | -.061           | .004           | -.066         |
| 75.0                         | -.108           | -.499          | .134          | -.096           | .000           | .091          | 165.0          | .018            | 1.600          | .064          | -.055           | .006           | -.055         |
| 80.0                         | -.106           | -.406          | .132          | -.097           | .000           | .089          | 170.0          | .020            | 1.592          | .061          | -.048           | .009           | -.048         |
| 85.0                         | -.105           | -.284          | .130          | -.098           | -.001          | .084          | 175.0          | .020            | 1.552          | .059          | -.042           | .004           | -.044         |
| 90.0                         | -.105           | -.107          | .124          | -.097           | -.001          | .080          | 180.0          | .021            | 1.513          | .058          | -.035           | .018           | -.055         |

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Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 140.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE |       | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|-------|--------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                |       | NORMAL             | AXIAL |                     |      |
| 0              | .009               | -.649 | .186                | .121 | 90.0           | .107  | -.106              | .114  | -.104               | .000 |
| 5.0            | -.025              | -.623 | .184                | .118 | 95.0           | -.108 | .119               | .102  | -.105               | .000 |
| 10.0           | -.049              | -.503 | .184                | .120 | 100.0          | -.109 | .341               | .092  | -.104               | .000 |
| 15.0           | -.066              | -.542 | .183                | .119 | 105.0          | -.105 | .592               | .077  | -.101               | .001 |
| 20.0           | -.081              | -.512 | .183                | .119 | 110.0          | -.087 | .928               | .062  | -.090               | .001 |
| 25.0           | -.093              | -.459 | .180                | .117 | 115.0          | -.057 | 1.168              | .039  | -.070               | .003 |
| 30.0           | -.102              | -.428 | .178                | .114 | 120.0          | -.032 | 1.388              | .016  | -.047               | .004 |
| 35.0           | -.110              | -.393 | .175                | .112 | 125.0          | -.014 | 1.507              | -.002 | -.028               | .005 |
| 40.0           | -.116              | -.351 | .171                | .108 | 130.0          | .000  | 1.603              | -.022 | -.025               | .002 |
| 45.0           | -.119              | -.374 | .165                | .105 | 135.0          | .008  | 1.648              | -.040 | -.030               | .001 |
| 50.0           | -.120              | -.473 | .155                | .102 | 140.0          | .014  | 1.633              | -.048 | -.041               | .001 |
| 55.0           | -.120              | -.581 | .146                | .098 | 145.0          | .018  | 1.612              | -.055 | -.060               | .000 |
| 60.0           | -.118              | -.674 | .138                | .095 | 150.0          | .021  | 1.583              | -.061 | -.067               | .000 |
| 65.0           | -.116              | -.695 | .133                | .092 | 155.0          | .022  | 1.572              | -.064 | -.066               | .001 |
| 70.0           | -.113              | -.610 | .131                | .090 | 160.0          | .023  | 1.549              | -.064 | -.061               | .002 |
| 75.0           | -.109              | -.544 | .129                | .087 | 165.0          | .022  | 1.548              | -.056 | -.056               | .002 |
| 80.0           | -.107              | -.434 | .125                | .084 | 170.0          | .023  | 1.542              | -.054 | -.048               | .004 |
| 85.0           | -.107              | -.289 | .121                | .079 | 175.0          | .022  | 1.528              | -.053 | -.041               | .000 |
| 90.0           | -.107              | -.106 | .114                | .075 | 180.0          | .022  | 1.532              | -.053 | -.033               | .007 |

\*\*\*AZIMUTH ANGLE = 145.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE |       | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|-------|--------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                |       | NORMAL             | AXIAL |                     |       |
| 0              | .012               | -.693 | .172                | .112 | 90.0           | -.109 | -.105              | .104  | -.112               | .002  |
| 5.0            | -.029              | -.663 | .171                | .108 | 95.0           | -.110 | .136               | .092  | -.112               | .002  |
| 10.0           | -.057              | -.603 | .171                | .111 | 100.0          | -.111 | .381               | .080  | -.111               | .002  |
| 15.0           | -.075              | -.572 | .170                | .110 | 105.0          | -.106 | .657               | .064  | -.106               | .002  |
| 20.0           | -.090              | -.538 | .170                | .111 | 110.0          | -.082 | 1.013              | .046  | -.093               | .002  |
| 25.0           | -.102              | -.515 | .168                | .109 | 115.0          | -.042 | 1.236              | .020  | -.064               | .003  |
| 30.0           | -.110              | -.504 | .165                | .107 | 120.0          | -.011 | 1.494              | -.006 | -.028               | .003  |
| 35.0           | -.116              | -.499 | .163                | .106 | 125.0          | .008  | 1.614              | -.023 | -.004               | .003  |
| 40.0           | -.121              | -.501 | .160                | .103 | 130.0          | .023  | 1.707              | -.035 | .010                | .000  |
| 45.0           | -.123              | -.548 | .155                | .101 | 135.0          | .030  | 1.717              | -.045 | .002                | .001  |
| 50.0           | -.124              | -.639 | .148                | .098 | 140.0          | .033  | 1.666              | -.048 | -.016               | -.001 |
| 55.0           | -.123              | -.731 | .143                | .095 | 145.0          | .035  | 1.611              | -.050 | -.050               | .000  |
| 60.0           | -.120              | -.792 | .137                | .092 | 150.0          | .032  | 1.541              | -.052 | -.064               | .000  |
| 65.0           | -.118              | -.798 | .132                | .089 | 155.0          | .032  | 1.531              | -.053 | -.065               | .000  |
| 70.0           | -.115              | -.696 | .128                | .086 | 160.0          | .030  | 1.498              | -.053 | -.061               | .000  |
| 75.0           | -.110              | -.590 | .124                | .083 | 165.0          | .027  | 1.496              | -.049 | -.057               | .000  |
| 80.0           | -.109              | -.462 | .118                | .079 | 170.0          | .026  | 1.492              | -.048 | -.048               | .002  |
| 85.0           | -.109              | -.295 | .112                | .075 | 175.0          | .024  | 1.504              | -.048 | -.040               | .005  |
| 90.0           | -.109              | -.105 | .104                | .070 | 180.0          | .023  | 1.552              | -.048 | -.031               | .002  |

Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 150.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-----|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW | PITCH               | ROLL |
| 0              | .016               | -.737 | .154                | .103 | 90.0           | -.112              | -.105 | .094                |     | -.120               | .004 |
| 5.0            | -.034              | -.704 | .158                | .098 | 95.0           | -.113              | .154  | .083                |     | -.120               | .004 |
| 10.0           | -.065              | -.643 | .158                | .103 | 100.0          | -.113              | .421  | .068                |     | -.118               | .004 |
| 15.0           | -.085              | -.602 | .157                | .102 | 105.0          | -.107              | .722  | .052                |     | -.112               | .003 |
| 20.0           | -.100              | -.564 | .158                | .103 | 110.0          | -.078              | 1.098 | .030                |     | -.096               | .003 |
| 25.0           | -.112              | -.572 | .156                | .102 | 115.0          | -.027              | 1.304 | .001                |     | -.058               | .003 |
| 30.0           | -.118              | -.581 | .153                | .101 | 120.0          | .009               | 1.600 | -.029               |     | -.010               | .002 |
| 35.0           | -.122              | -.606 | .151                | .100 | 125.0          | .031               | 1.722 | -.044               |     | -.037               | .001 |
| 40.0           | -.126              | -.651 | .149                | .098 | 130.0          | .046               | 1.811 | -.049               |     | -.046               | .002 |
| 45.0           | -.127              | -.722 | .146                | .097 | 135.0          | .052               | 1.786 | -.050               |     | -.034               | .004 |
| 50.0           | -.128              | -.806 | .142                | .094 | 140.0          | .053               | 1.700 | -.048               |     | -.008               | .003 |
| 55.0           | -.127              | -.881 | .140                | .092 | 145.0          | .052               | 1.610 | -.045               |     | -.040               | .002 |
| 60.0           | -.123              | -.911 | .136                | .089 | 150.0          | .049               | 1.500 | -.043               |     | -.062               | .000 |
| 65.0           | -.120              | -.901 | .131                | .086 | 155.0          | .042               | 1.490 | -.042               |     | -.064               | .000 |
| 70.0           | -.117              | -.783 | .125                | .083 | 160.0          | .037               | 1.447 | -.042               |     | -.061               | .002 |
| 75.0           | -.112              | -.656 | .119                | .079 | 165.0          | .032               | 1.445 | -.042               |     | -.058               | .004 |
| 80.0           | -.111              | -.491 | .111                | .075 | 170.0          | .029               | 1.443 | -.042               |     | -.048               | .007 |
| 85.0           | -.111              | -.301 | .103                | .071 | 175.0          | .026               | 1.480 | -.043               |     | -.039               | .010 |
| 90.0           | -.112              | -.105 | .094                | .065 | 180.0          | .025               | 1.572 | -.044               |     | -.030               | .013 |

\*\*\*AZIMUTH ANGLE = 155.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-----|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW | PITCH               | ROLL |
| 0              | .016               | -.807 | .132                | .088 | 90.0           | -.115              | -.022 | .074                |     | -.120               | .005 |
| 5.0            | -.036              | -.781 | .132                | .084 | 95.0           | -.115              | .245  | .064                |     | -.120               | .005 |
| 10.0           | -.068              | -.729 | .131                | .088 | 100.0          | -.114              | .508  | .052                |     | -.118               | .005 |
| 15.0           | -.088              | -.692 | .131                | .088 | 105.0          | -.107              | .808  | .039                |     | -.112               | .004 |
| 20.0           | -.104              | -.666 | .131                | .088 | 110.0          | -.081              | 1.118 | .020                |     | -.095               | .004 |
| 25.0           | -.116              | -.645 | .128                | .088 | 115.0          | -.035              | 1.313 | -.001               |     | -.057               | .004 |
| 30.0           | -.128              | -.634 | .127                | .087 | 120.0          | .006               | 1.557 | -.025               |     | -.010               | .003 |
| 35.0           | -.132              | -.641 | .125                | .086 | 125.0          | .035               | 1.670 | -.037               |     | .033                | .002 |
| 40.0           | -.132              | -.662 | .123                | .084 | 130.0          | .051               | 1.732 | -.043               |     | .047                | .000 |
| 45.0           | -.134              | -.701 | .120                | .083 | 135.0          | .056               | 1.715 | -.044               |     | .036                | .001 |
| 50.0           | -.136              | -.768 | .117                | .081 | 140.0          | .056               | 1.647 | -.043               |     | .008                | .001 |
| 55.0           | -.136              | -.831 | .115                | .080 | 145.0          | .052               | 1.576 | -.040               |     | -.038               | .000 |
| 60.0           | -.133              | -.862 | .111                | .078 | 150.0          | .048               | 1.498 | -.037               |     | -.057               | .000 |
| 65.0           | -.127              | -.839 | .106                | .075 | 155.0          | .042               | 1.487 | -.036               |     | -.061               | .000 |
| 70.0           | -.122              | -.722 | .101                | .073 | 160.0          | .037               | 1.458 | -.035               |     | -.061               | .002 |
| 75.0           | -.116              | -.574 | .096                | .070 | 165.0          | .032               | 1.456 | -.035               |     | -.061               | .003 |
| 80.0           | -.115              | -.425 | .089                | .067 | 170.0          | .030               | 1.455 | -.035               |     | -.055               | .006 |
| 85.0           | -.114              | -.234 | .082                | .064 | 175.0          | .028               | 1.480 | -.035               |     | -.049               | .008 |
| 90.0           | -.115              | -.022 | .074                | .059 | 180.0          | .027               | 1.555 | -.036               |     | -.042               | .010 |

Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 160.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     | MOMENT COEFFICIENTS |      |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-----|---------------------|------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW | PITCH               | ROLL | YAW   |
| 0              | .017               | -.878 | .106                | .074 | 90.0           | -.118              | .059  | .054                |     | -.121               | .007 | .053  |
| 5.0            | -.039              | -.858 | .106                | .071 | 95.0           | -.118              | .336  | .046                |     | -.121               | .007 | .049  |
| 10.0           | -.071              | -.815 | .105                | .073 | 100.0          | -.115              | .596  | .036                |     | -.119               | .006 | .044  |
| 15.0           | -.092              | -.782 | .105                | .074 | 105.0          | -.107              | .894  | .026                |     | -.112               | .006 | .038  |
| 20.0           | -.109              | -.769 | .104                | .074 | 110.0          | -.084              | 1.139 | .010                |     | -.094               | .006 | .028  |
| 25.0           | -.120              | -.718 | .100                | .074 | 115.0          | -.043              | 1.323 | -.004               |     | -.056               | .005 | .015  |
| 30.0           | -.128              | -.695 | .101                | .073 | 120.0          | .003               | 1.515 | -.021               |     | -.010               | .005 | .001  |
| 35.0           | -.134              | -.676 | .099                | .072 | 125.0          | .039               | 1.618 | -.031               |     | .030                | .004 | -.015 |
| 40.0           | -.138              | -.673 | .097                | .071 | 130.0          | .056               | 1.653 | -.037               |     | .048                | .003 | -.032 |
| 45.0           | -.142              | -.681 | .095                | .070 | 135.0          | .061               | 1.645 | -.039               |     | .039                | .002 | -.036 |
| 50.0           | -.144              | -.730 | .092                | .068 | 140.0          | .059               | 1.594 | -.038               |     | .009                | .001 | -.034 |
| 55.0           | -.145              | -.782 | .090                | .068 | 145.0          | .053               | 1.543 | -.035               |     | -.036               | .000 | -.031 |
| 60.0           | -.143              | -.813 | .086                | .067 | 150.0          | .047               | 1.496 | -.032               |     | -.052               | .000 | -.028 |
| 65.0           | -.135              | -.777 | .082                | .065 | 155.0          | .042               | 1.484 | -.030               |     | -.058               | .000 | -.026 |
| 70.0           | -.127              | -.662 | .077                | .063 | 160.0          | .037               | 1.469 | -.028               |     | -.061               | .002 | -.025 |
| 75.0           | -.121              | -.513 | .074                | .062 | 165.0          | .033               | 1.468 | -.028               |     | -.064               | .003 | -.024 |
| 80.0           | -.119              | -.359 | .067                | .059 | 170.0          | .031               | 1.468 | -.028               |     | -.062               | .005 | -.024 |
| 85.0           | -.118              | -.168 | .061                | .057 | 175.0          | .030               | 1.480 | -.028               |     | -.060               | .006 | -.025 |
| 90.0           | -.118              | .059  | .054                | .053 | 180.0          | .029               | 1.539 | -.029               |     | -.055               | .008 | -.026 |

\*\*\*AZIMUTH ANGLE = 165.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     | MOMENT COEFFICIENTS |      |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-----|---------------------|------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW | PITCH               | ROLL | YAW   |
| 0              | .018               | -.949 | .081                | .060 | 90.0           | -.122              | .142  | .034                |     | -.122               | .009 | .047  |
| 5.0            | -.042              | -.935 | .080                | .058 | 95.0           | -.121              | .428  | .028                |     | -.122               | .009 | .045  |
| 10.0           | -.075              | -.902 | .079                | .059 | 100.0          | -.117              | .684  | .021                |     | -.120               | .008 | .041  |
| 15.0           | -.096              | -.873 | .079                | .060 | 105.0          | -.108              | .960  | .013                |     | -.113               | .008 | .037  |
| 20.0           | -.114              | -.872 | .078                | .060 | 110.0          | -.088              | 1.160 | .001                |     | -.094               | .008 | .030  |
| 25.0           | -.125              | -.791 | .073                | .060 | 115.0          | -.052              | 1.333 | -.007               |     | -.055               | .007 | .021  |
| 30.0           | -.133              | -.753 | .075                | .059 | 120.0          | .000               | 1.473 | -.017               |     | -.011               | .007 | .012  |
| 35.0           | -.140              | -.712 | .073                | .058 | 125.0          | .043               | 1.566 | -.025               |     | .027                | .006 | -.001 |
| 40.0           | -.145              | -.684 | .072                | .058 | 130.0          | .061               | 1.574 | -.031               |     | .050                | .006 | -.012 |
| 45.0           | -.150              | -.661 | .070                | .057 | 135.0          | .066               | 1.575 | -.034               |     | .042                | .005 | -.020 |
| 50.0           | -.152              | -.693 | .067                | .055 | 140.0          | .062               | 1.541 | -.033               |     | .010                | .003 | -.025 |
| 55.0           | -.154              | -.733 | .065                | .057 | 145.0          | .054               | 1.510 | -.030               |     | -.035               | .002 | -.026 |
| 60.0           | -.153              | -.764 | .062                | .056 | 150.0          | .047               | 1.495 | -.027               |     | -.047               | .001 | -.025 |
| 65.0           | -.143              | -.716 | .058                | .055 | 155.0          | .042               | 1.481 | -.024               |     | -.055               | .001 | -.023 |
| 70.0           | -.133              | -.602 | .054                | .054 | 160.0          | .037               | 1.481 | -.022               |     | -.062               | .002 | -.022 |
| 75.0           | -.126              | -.452 | .052                | .054 | 165.0          | .034               | 1.480 | -.022               |     | -.068               | .003 | -.021 |
| 80.0           | -.123              | -.294 | .045                | .052 | 170.0          | .033               | 1.481 | -.021               |     | -.070               | .004 | -.020 |
| 85.0           | -.122              | -.102 | .040                | .050 | 175.0          | .032               | 1.481 | -.021               |     | -.071               | .005 | -.020 |
| 90.0           | -.122              | .142  | .034                | .047 | 180.0          | .032               | 1.523 | -.022               |     | -.068               | .006 | -.021 |

Table A-2 cont'd

| ***AZIMUTH ANGLE = 170.0**** |                    |       |      |                     |      |      |                |                    |       |      |                     |      |       |
|------------------------------|--------------------|-------|------|---------------------|------|------|----------------|--------------------|-------|------|---------------------|------|-------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |       |
|                              | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW   |
| 0                            | .022               | -.953 | .054 | -.018               | .005 | .040 | 90.0           | -.132              | .094  | .020 | -.116               | .006 | .031  |
| 5.0                          | -.030              | -.945 | .054 | -.009               | .005 | .039 | 95.0           | -.129              | .385  | .016 | -.114               | .006 | .030  |
| 10.0                         | -.063              | -.918 | .053 | -.001               | .005 | .040 | 100.0          | -.125              | .623  | .011 | -.108               | .005 | .027  |
| 15.0                         | -.087              | -.875 | .053 | -.012               | .006 | .040 | 105.0          | -.112              | .981  | .005 | -.098               | .005 | .026  |
| 20.0                         | -.109              | -.875 | .053 | -.022               | .006 | .040 | 110.0          | -.085              | 1.190 | .003 | -.076               | .005 | .020  |
| 25.0                         | -.126              | -.805 | .049 | -.035               | .006 | .040 | 115.0          | -.046              | 1.422 | .008 | -.037               | .005 | .014  |
| 30.0                         | -.139              | -.766 | .051 | -.048               | .006 | .040 | 120.0          | .026               | 1.592 | .015 | .009                | .005 | .008  |
| 35.0                         | -.150              | -.712 | .050 | -.063               | .007 | .039 | 125.0          | .070               | 1.704 | .019 | .048                | .004 | .000  |
| 40.0                         | -.159              | -.660 | .049 | -.080               | .007 | .039 | 130.0          | .085               | 1.649 | .022 | .059                | .004 | -.008 |
| 45.0                         | -.167              | -.618 | .048 | -.094               | .007 | .038 | 135.0          | .080               | 1.583 | .023 | .042                | .004 | -.013 |
| 50.0                         | -.172              | -.632 | .045 | -.104               | .006 | .037 | 140.0          | .068               | 1.527 | .022 | .012                | .002 | -.017 |
| 55.0                         | -.176              | -.651 | .043 | -.110               | .006 | .038 | 145.0          | .058               | 1.497 | .019 | -.026               | .001 | -.017 |
| 60.0                         | -.174              | -.711 | .041 | -.115               | .006 | .037 | 150.0          | .050               | 1.484 | .017 | -.038               | .001 | -.017 |
| 65.0                         | -.159              | -.730 | .038 | -.117               | .006 | .036 | 155.0          | .042               | 1.458 | .015 | -.045               | .000 | -.016 |
| 70.0                         | -.146              | -.601 | .035 | -.115               | .007 | .036 | 160.0          | .038               | 1.480 | .014 | -.051               | .000 | -.015 |
| 75.0                         | -.137              | -.468 | .033 | -.116               | .006 | .036 | 165.0          | .035               | 1.486 | .014 | -.056               | .001 | -.014 |
| 80.0                         | -.134              | -.323 | .028 | -.117               | .006 | .034 | 170.0          | .034               | 1.497 | .014 | -.058               | .002 | -.014 |
| 85.0                         | -.132              | -.132 | .024 | -.117               | .006 | .033 | 175.0          | .033               | 1.494 | .014 | -.060               | .003 | -.015 |
| 90.0                         | -.132              | .094  | .020 | -.116               | .006 | .031 | 180.0          | .032               | 1.522 | .015 | -.058               | .004 | -.015 |

| ***AZIMUTH ANGLE = 175.0**** |                    |       |      |                     |      |      |                |                    |       |      |                     |      |       |
|------------------------------|--------------------|-------|------|---------------------|------|------|----------------|--------------------|-------|------|---------------------|------|-------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |       |
|                              | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW   |
| 0                            | .026               | -.957 | .028 | -.002               | .003 | .021 | 90.0           | -.142              | .047  | .006 | -.110               | .003 | .015  |
| 5.0                          | -.019              | -.955 | .028 | -.007               | .003 | .020 | 95.0           | -.137              | .343  | .004 | -.106               | .003 | .015  |
| 10.0                         | -.051              | -.934 | .027 | -.012               | .003 | .021 | 100.0          | -.133              | .563  | .001 | -.096               | .003 | .014  |
| 15.0                         | -.078              | -.878 | .028 | -.020               | .003 | .021 | 105.0          | -.117              | .982  | .002 | -.083               | .003 | .013  |
| 20.0                         | -.104              | -.878 | .028 | -.027               | .003 | .021 | 110.0          | -.082              | 1.220 | .007 | -.058               | .003 | .010  |
| 25.0                         | -.128              | -.819 | .026 | -.037               | .002 | .021 | 115.0          | -.041              | 1.511 | .009 | -.019               | .003 | .007  |
| 30.0                         | -.145              | -.779 | .027 | -.049               | .002 | .021 | 120.0          | .052               | 1.711 | .013 | .029                | .003 | .004  |
| 35.0                         | -.160              | -.712 | .027 | -.066               | .003 | .020 | 125.0          | .097               | 1.842 | .014 | .069                | .003 | .000  |
| 40.0                         | -.174              | -.636 | .026 | -.087               | .003 | .020 | 130.0          | .110               | 1.724 | .013 | .068                | .003 | -.004 |
| 45.0                         | -.184              | -.575 | .026 | -.103               | .003 | .019 | 135.0          | .095               | 1.591 | .013 | .042                | .003 | -.007 |
| 50.0                         | -.192              | -.571 | .023 | -.114               | .002 | .019 | 140.0          | .074               | 1.513 | .011 | .015                | .002 | -.009 |
| 55.0                         | -.198              | -.569 | .022 | -.117               | .003 | .019 | 145.0          | .063               | 1.484 | .009 | -.018               | .001 | -.009 |
| 60.0                         | -.195              | -.658 | .020 | -.119               | .003 | .019 | 150.0          | .054               | 1.473 | .008 | -.029               | .001 | -.009 |
| 65.0                         | -.175              | -.744 | .018 | -.118               | .003 | .018 | 155.0          | .043               | 1.435 | .007 | -.035               | .000 | -.009 |
| 70.0                         | -.159              | -.601 | .016 | -.112               | .004 | .018 | 160.0          | .040               | 1.480 | .006 | -.040               | .000 | -.008 |
| 75.0                         | -.149              | -.484 | .014 | -.113               | .003 | .018 | 165.0          | .037               | 1.493 | .006 | -.044               | .000 | -.008 |
| 80.0                         | -.146              | -.353 | .011 | -.114               | .003 | .017 | 170.0          | .036               | 1.514 | .007 | -.047               | .000 | -.008 |
| 85.0                         | -.143              | -.162 | .009 | -.113               | .003 | .016 | 175.0          | .035               | 1.508 | .007 | -.049               | .001 | -.009 |
| 90.0                         | -.142              | .047  | .006 | -.110               | .003 | .015 | 180.0          | .032               | 1.521 | .008 | -.048               | .003 | -.009 |

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Table A-2 cont'd

\*\*\*AZIMUTH ANGLE = 180.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |  |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|--|
|                | NORMAL             | AXIAL | SIDE                | ROLL  | YAW            | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |  |
| .0             | .030               | -.961 | .002                | .001  | .002           | -.153              | .000  | -.007               | -.104 | .001                | .000  |  |
| 5.0            | -.008              | -.966 | .002                | .001  | .002           | -.145              | .301  | -.008               | -.098 | .001                | .001  |  |
| 10.0           | -.039              | -.951 | .002                | .001  | .002           | -.141              | .503  | -.009               | -.084 | .001                | .000  |  |
| 15.0           | -.070              | -.881 | .003                | .000  | .002           | -.122              | .983  | -.010               | -.069 | .001                | .000  |  |
| 20.0           | -.100              | -.881 | .003                | .000  | .002           | -.080              | 1.250 | -.011               | -.040 | .001                | .000  |  |
| 25.0           | -.130              | -.834 | .003                | -.001 | .002           | -.036              | 1.600 | -.011               | -.001 | .001                | .000  |  |
| 30.0           | -.151              | -.792 | .004                | -.001 | .002           | .078               | 1.831 | -.011               | .049  | .002                | .000  |  |
| 35.0           | -.171              | -.713 | .004                | -.001 | .001           | .124               | 1.981 | -.009               | .091  | .002                | .000  |  |
| 40.0           | -.189              | -.613 | .004                | -.001 | .001           | .135               | 1.800 | -.005               | .078  | .002                | -.001 |  |
| 45.0           | -.201              | -.533 | .004                | -.001 | .001           | .110               | 1.600 | -.003               | .042  | .002                | -.001 |  |
| 50.0           | -.212              | -.511 | .002                | -.001 | .001           | .081               | 1.500 | .000                | .018  | .002                | -.001 |  |
| 55.0           | -.220              | -.487 | .001                | .000  | .001           | .068               | 1.471 | .001                | -.010 | .001                | -.001 |  |
| 60.0           | -.216              | -.605 | .000                | .000  | .001           | .058               | 1.462 | .001                | -.020 | .001                | -.001 |  |
| 65.0           | -.192              | -.758 | -.001               | .000  | .000           | .044               | 1.413 | .001                | -.025 | .001                | -.002 |  |
| 70.0           | -.172              | -.601 | -.002               | .001  | .000           | .042               | 1.480 | .001                | -.030 | .002                | -.002 |  |
| 75.0           | -.161              | -.501 | -.004               | .001  | .000           | .039               | 1.500 | .001                | -.032 | .002                | -.002 |  |
| 80.0           | -.158              | -.383 | -.005               | .001  | .000           | .038               | 1.531 | .000                | -.036 | .001                | -.002 |  |
| 85.0           | -.154              | -.193 | -.006               | .001  | .000           | .037               | 1.522 | -.001               | -.038 | .000                | -.003 |  |
| 90.0           | -.153              | .000  | -.007               | .001  | .000           | .032               | 1.521 | -.002               | -.038 | -.002               | -.003 |  |

Table A-3. Wind load coefficients for paraboloid,  $F/D = 0.313$ ,  $H/D = 0.200$ , porosity 25%

| ****AZIMUTH ANGLE = .0**** |                    |       |                     |       |                |                    |       |                     |       |                     |       |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|                            | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | YAW                 | YAW   |
| .0                         | -.004              | 1.171 | -.005               | .033  | 90.0           | .150               | -.050 | .071                | .000  | .000                | .000  |
| 5.0                        | -.005              | 1.161 | -.005               | .029  | 95.0           | .155               | -.120 | .078                | -.001 | -.002               | -.002 |
| 10.0                       | -.005              | 1.151 | -.005               | .024  | 100.0          | .163               | -.170 | .088                | -.001 | -.001               | -.004 |
| 15.0                       | -.001              | 1.143 | -.005               | .022  | 105.0          | .175               | -.200 | .097                | -.001 | -.006               | -.006 |
| 20.0                       | .007               | 1.132 | -.005               | .020  | 110.0          | .188               | -.241 | .102                | -.001 | -.004               | -.004 |
| 25.0                       | .020               | 1.112 | -.004               | .020  | 115.0          | .200               | -.291 | .105                | .000  | .003                | .003  |
| 30.0                       | .031               | 1.091 | -.003               | .020  | 120.0          | .209               | -.341 | .108                | .001  | .005                | .005  |
| 35.0                       | .045               | 1.081 | -.002               | .020  | 125.0          | .213               | -.412 | .109                | .001  | .004                | .004  |
| 40.0                       | .060               | 1.063 | -.001               | .020  | 130.0          | .210               | -.513 | .110                | .001  | .003                | .003  |
| 45.0                       | .080               | 1.032 | .002                | .020  | 135.0          | .210               | -.594 | .110                | .000  | .001                | .001  |
| 50.0                       | .109               | .995  | .002                | .034  | 140.0          | .204               | -.683 | .101                | -.001 | .001                | .001  |
| 55.0                       | .132               | .941  | .001                | .041  | 145.0          | .191               | -.720 | .075                | -.002 | .001                | .001  |
| 60.0                       | .144               | .862  | .001                | .048  | 150.0          | .176               | -.761 | .037                | -.003 | .002                | .002  |
| 65.0                       | .159               | .731  | .000                | .025  | 155.0          | .158               | -.800 | .013                | -.002 | .000                | .000  |
| 70.0                       | .149               | .581  | -.001               | .055  | 160.0          | .125               | -.831 | -.008               | .000  | .000                | .000  |
| 75.0                       | .148               | .441  | -.002               | .060  | 165.0          | .100               | -.852 | -.020               | .002  | .000                | .000  |
| 80.0                       | .148               | .282  | -.003               | .064  | 170.0          | .064               | -.871 | -.026               | .003  | .003                | .003  |
| 85.0                       | .148               | .100  | -.004               | .067  | 175.0          | .032               | -.881 | -.029               | .002  | .002                | .002  |
| 90.0                       | .150               | -.050 | -.004               | .071  | 180.0          | -.010              | -.893 | -.030               | .001  | .002                | .002  |

| ****AZIMUTH ANGLE = 5.0**** |                    |       |                     |       |                |                    |       |                     |       |                     |      |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | YAW                 | YAW  |
| .0                          | -.001              | 1.171 | -.006               | .039  | 90.0           | .169               | -.036 | .080                | -.001 | .005                | .005 |
| 5.0                         | -.002              | 1.165 | -.006               | .035  | 95.0           | .172               | -.117 | .084                | -.002 | .004                | .004 |
| 10.0                        | -.002              | 1.151 | -.007               | .032  | 100.0          | .174               | -.177 | .091                | -.002 | .003                | .003 |
| 15.0                        | .000               | 1.142 | -.006               | .030  | 105.0          | .178               | -.220 | .097                | -.002 | .002                | .002 |
| 20.0                        | .006               | 1.131 | -.004               | .029  | 110.0          | .185               | -.264 | .100                | -.001 | .004                | .004 |
| 25.0                        | .020               | 1.108 | -.001               | .029  | 115.0          | .194               | -.314 | .102                | .000  | .009                | .009 |
| 30.0                        | .031               | 1.084 | -.003               | .028  | 120.0          | .201               | -.364 | .104                | .000  | .011                | .011 |
| 35.0                        | .044               | 1.075 | .005                | .026  | 125.0          | .204               | -.429 | .104                | .000  | .010                | .010 |
| 40.0                        | .059               | 1.056 | .009                | .025  | 130.0          | .199               | -.520 | .104                | .001  | .010                | .010 |
| 45.0                        | .078               | 1.028 | .011                | .025  | 135.0          | .192               | -.593 | .103                | .000  | .009                | .009 |
| 50.0                        | .105               | .991  | .012                | .031  | 140.0          | .182               | -.662 | .095                | .000  | .009                | .009 |
| 55.0                        | .128               | .934  | .013                | .041  | 145.0          | .165               | -.720 | .076                | .000  | .009                | .009 |
| 60.0                        | .143               | .854  | .014                | .051  | 150.0          | .146               | -.761 | .048                | .000  | .010                | .010 |
| 65.0                        | .161               | .728  | .015                | .059  | 155.0          | .125               | -.800 | .028                | .000  | .010                | .010 |
| 70.0                        | .162               | .584  | .016                | .066  | 160.0          | .093               | -.827 | .010                | .001  | .011                | .011 |
| 75.0                        | .167               | .441  | .017                | .071  | 165.0          | .069               | -.849 | -.002               | .003  | .011                | .011 |
| 80.0                        | .169               | .278  | .017                | .075  | 170.0          | .041               | -.865 | -.011               | .003  | .010                | .010 |
| 85.0                        | .170               | .107  | .017                | .077  | 175.0          | .016               | -.871 | -.017               | .002  | .010                | .010 |
| 90.0                        | .169               | -.036 | .017                | .080  | 180.0          | -.012              | -.879 | -.022               | .002  | .009                | .009 |

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Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 10.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | PITCH               | ROLL  | YAW  |
| 0              | .001               | 1.172 | -.008               | .045  | 90.0           | .189               | -.023 | .039                | .089  | .089                | -.002 | .010 |
| 5.0            | .001               | 1.169 | -.008               | .042  | 95.0           | .189               | -.114 | .040                | .091  | .091                | -.003 | .011 |
| 10.0           | .001               | 1.151 | -.009               | .040  | 100.0          | .185               | -.184 | .042                | .094  | .094                | -.003 | .011 |
| 15.0           | .001               | 1.141 | -.007               | .039  | 105.0          | .182               | -.211 | .042                | .097  | .097                | -.003 | .011 |
| 20.0           | .006               | 1.131 | -.003               | .038  | 110.0          | .183               | -.267 | .042                | .098  | .098                | -.002 | .013 |
| 25.0           | .020               | 1.104 | -.002               | .038  | 115.0          | .188               | -.338 | .041                | .099  | .099                | -.001 | .016 |
| 30.0           | .031               | 1.077 | -.009               | .037  | 120.0          | .193               | -.388 | .040                | .100  | .100                | .000  | .017 |
| 35.0           | .044               | 1.069 | -.013               | .033  | 125.0          | .195               | -.446 | .040                | .100  | .100                | .000  | .018 |
| 40.0           | .059               | 1.049 | -.018               | .030  | 130.0          | .185               | -.527 | .040                | .099  | .099                | .001  | .017 |
| 45.0           | .077               | 1.024 | -.021               | .031  | 135.0          | .174               | -.593 | .041                | .096  | .096                | .001  | .017 |
| 50.0           | .102               | .987  | -.022               | .037  | 140.0          | .161               | -.661 | .041                | .090  | .090                | .002  | .017 |
| 55.0           | .124               | .928  | -.025               | .048  | 145.0          | .140               | -.721 | .041                | .077  | .077                | .002  | .018 |
| 60.0           | .142               | .847  | -.027               | .061  | 150.0          | .117               | -.762 | .041                | .059  | .059                | .001  | .018 |
| 65.0           | .163               | .725  | -.030               | .071  | 155.0          | .092               | -.800 | .041                | .043  | .043                | .002  | .018 |
| 70.0           | .176               | .588  | -.034               | .078  | 160.0          | .061               | -.823 | .040                | .028  | .028                | .003  | .019 |
| 75.0           | .147               | .442  | -.036               | .082  | 165.0          | .039               | -.846 | .041                | .014  | .014                | .004  | .019 |
| 80.0           | .190               | .274  | -.037               | .086  | 170.0          | .018               | -.859 | .044                | .004  | .004                | .003  | .018 |
| 85.0           | .192               | .114  | -.038               | .087  | 175.0          | .000               | -.862 | .042                | -.005 | -.005               | .003  | .018 |
| 90.0           | .189               | -.023 | -.039               | .089  | 180.0          | -.015              | -.865 | .046                | -.015 | -.015               | .003  | .016 |

\*\*\*AZIMUTH ANGLE = 15.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | PITCH               | ROLL  | YAW  |
| 0              | .004               | 1.173 | -.010               | .051  | 90.0           | .209               | -.010 | .061                | .098  | .098                | -.004 | .016 |
| 5.0            | .004               | 1.173 | -.010               | .049  | 95.0           | .206               | -.111 | .062                | .098  | .098                | -.005 | .018 |
| 10.0           | .004               | 1.152 | -.011               | .048  | 100.0          | .196               | -.192 | .064                | .097  | .097                | -.004 | .019 |
| 15.0           | .002               | 1.141 | -.008               | .048  | 105.0          | .186               | -.262 | .062                | .097  | .097                | -.004 | .020 |
| 20.0           | .006               | 1.131 | -.002               | .048  | 110.0          | .181               | -.310 | .062                | .097  | .097                | -.003 | .022 |
| 25.0           | .020               | 1.100 | -.005               | .048  | 115.0          | .182               | -.362 | .062                | .097  | .097                | -.002 | .023 |
| 30.0           | .032               | 1.070 | -.015               | .046  | 120.0          | .186               | -.412 | .061                | .097  | .097                | -.001 | .024 |
| 35.0           | .044               | 1.063 | -.021               | .040  | 125.0          | .186               | -.463 | .061                | .096  | .096                | .000  | .025 |
| 40.0           | .059               | 1.042 | -.027               | .036  | 130.0          | .171               | -.534 | .061                | .094  | .094                | .001  | .025 |
| 45.0           | .076               | 1.021 | -.031               | .037  | 135.0          | .156               | -.593 | .061                | .090  | .090                | .002  | .026 |
| 50.0           | .099               | .983  | -.033               | .044  | 140.0          | .140               | -.660 | .061                | .085  | .085                | .004  | .026 |
| 55.0           | .120               | .922  | -.037               | .056  | 145.0          | .115               | -.722 | .062                | .078  | .078                | .004  | .027 |
| 60.0           | .142               | .840  | -.041               | .072  | 150.0          | .088               | -.763 | .061                | .070  | .070                | .004  | .027 |
| 65.0           | .165               | .723  | -.046               | .083  | 155.0          | .060               | -.800 | .062                | .059  | .059                | .004  | .027 |
| 70.0           | .190               | .592  | -.052               | .090  | 160.0          | .030               | -.820 | .062                | .046  | .046                | .005  | .027 |
| 75.0           | .207               | .443  | -.056               | .094  | 165.0          | .009               | -.843 | .063                | .032  | .032                | .005  | .027 |
| 80.0           | .212               | .271  | -.058               | .097  | 170.0          | -.004              | -.853 | .067                | .019  | .019                | .004  | .026 |
| 85.0           | .215               | .122  | -.060               | .098  | 175.0          | -.015              | -.853 | .063                | .006  | .006                | .004  | .026 |
| 90.0           | .209               | -.010 | -.061               | .098  | 180.0          | -.018              | -.852 | .068                | -.008 | -.008               | .004  | .024 |

Table A-3 cont'd

| ***AZIMUTH ANGLE = 20.0*** |                    |       |                     |      |                |                    |       |                     |      |                     |       |      |
|----------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       | YAW  |
|                            | NORMAL             | AXIAL | AXIAL               | SIDE |                | NORMAL             | AXIAL | AXIAL               | SIDE | PITCH               | ROLL  |      |
| 0                          | .004               | 1.159 | .001                | .001 | 90.0           | .197               | -.013 | -.013               | .076 | .089                | -.003 | .025 |
| 5.0                        | .005               | 1.157 | .002                | .002 | 95.0           | .194               | -.009 | -.111               | .075 | .090                | -.003 | .026 |
| 10.0                       | .006               | 1.134 | .003                | .003 | 100.0          | .185               | -.008 | -.188               | .075 | .091                | -.002 | .028 |
| 15.0                       | .006               | 1.124 | .004                | .004 | 105.0          | .178               | -.006 | -.255               | .074 | .091                | -.002 | .031 |
| 20.0                       | .010               | 1.115 | .009                | .009 | 110.0          | .175               | -.007 | -.297               | .074 | .091                | -.001 | .035 |
| 25.0                       | .022               | 1.077 | .015                | .015 | 115.0          | .178               | -.008 | -.334               | .076 | .090                | .000  | .037 |
| 30.0                       | .033               | 1.063 | .025                | .025 | 120.0          | .182               | -.008 | -.374               | .079 | .091                | .000  | .040 |
| 35.0                       | .045               | 1.052 | .031                | .031 | 125.0          | .181               | -.010 | -.416               | .082 | .091                | .001  | .042 |
| 40.0                       | .061               | 1.031 | .038                | .038 | 130.0          | .171               | -.012 | -.473               | .087 | .091                | .001  | .044 |
| 45.0                       | .081               | 1.011 | .044                | .044 | 135.0          | .159               | -.012 | -.528               | .090 | .088                | .001  | .045 |
| 50.0                       | .103               | .969  | .048                | .048 | 140.0          | .146               | -.001 | -.593               | .092 | .084                | .002  | .045 |
| 55.0                       | .123               | .905  | .054                | .054 | 145.0          | .126               | .004  | -.652               | .096 | .074                | .002  | .047 |
| 60.0                       | .143               | .817  | .060                | .060 | 150.0          | .105               | .006  | -.692               | .097 | .061                | .002  | .048 |
| 65.0                       | .163               | .696  | .066                | .066 | 155.0          | .081               | .005  | -.733               | .100 | .049                | .003  | .049 |
| 70.0                       | .183               | .561  | .072                | .072 | 160.0          | .056               | .002  | -.760               | .101 | .036                | .006  | .050 |
| 75.0                       | .198               | .408  | .076                | .076 | 165.0          | .034               | -.001 | -.785               | .103 | .025                | .007  | .050 |
| 80.0                       | .202               | .247  | .077                | .077 | 170.0          | .017               | -.003 | -.802               | .106 | .016                | .004  | .050 |
| 85.0                       | .203               | .108  | .077                | .077 | 175.0          | .000               | .000  | -.806               | .104 | .007                | .003  | .050 |
| 90.0                       | .197               | -.013 | .076                | .076 | 180.0          | -.013              | -.003 | -.804               | .107 | -.002               | .003  | .048 |
| ***AZIMUTH ANGLE = 25.0*** |                    |       |                     |      |                |                    |       |                     |      |                     |       |      |
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       | YAW  |
|                            | NORMAL             | AXIAL | AXIAL               | SIDE |                | NORMAL             | AXIAL | AXIAL               | SIDE | PITCH               | ROLL  |      |
| 0                          | .004               | 1.145 | .013                | .013 | 90.0           | .186               | -.011 | -.016               | .092 | .061                | -.002 | .034 |
| 5.0                        | .006               | 1.141 | .014                | .014 | 95.0           | .182               | -.003 | -.112               | .089 | .083                | -.002 | .035 |
| 10.0                       | .008               | 1.117 | .018                | .018 | 100.0          | .175               | -.003 | -.184               | .087 | .085                | -.001 | .038 |
| 15.0                       | .011               | 1.108 | .017                | .017 | 105.0          | .171               | .006  | -.249               | .086 | .086                | .001  | .042 |
| 20.0                       | .015               | 1.099 | .021                | .021 | 110.0          | .170               | .005  | -.285               | .087 | .085                | .000  | .048 |
| 25.0                       | .024               | 1.054 | .026                | .026 | 115.0          | .175               | -.014 | -.307               | .090 | .084                | .001  | .052 |
| 30.0                       | .034               | 1.056 | .035                | .035 | 120.0          | .179               | -.007 | -.337               | .097 | .085                | .001  | .057 |
| 35.0                       | .046               | 1.042 | .041                | .041 | 125.0          | .177               | -.006 | -.370               | .103 | .086                | .002  | .060 |
| 40.0                       | .064               | 1.020 | .049                | .049 | 130.0          | .171               | -.007 | -.412               | .113 | .088                | .001  | .063 |
| 45.0                       | .086               | 1.002 | .057                | .057 | 135.0          | .162               | -.006 | -.464               | .119 | .087                | .001  | .064 |
| 50.0                       | .108               | .955  | .064                | .064 | 140.0          | .152               | -.002 | -.527               | .124 | .083                | .001  | .065 |
| 55.0                       | .127               | .849  | .072                | .072 | 145.0          | .138               | .001  | -.583               | .130 | .071                | .001  | .067 |
| 60.0                       | .144               | .794  | .079                | .079 | 150.0          | .122               | .002  | -.622               | .134 | .052                | .001  | .069 |
| 65.0                       | .161               | .669  | .086                | .086 | 155.0          | .103               | .002  | -.666               | .138 | .039                | .002  | .072 |
| 70.0                       | .177               | .530  | .092                | .092 | 160.0          | .082               | .000  | -.700               | .140 | .026                | .007  | .073 |
| 75.0                       | .189               | .374  | .096                | .096 | 165.0          | .060               | -.001 | -.728               | .143 | .019                | .009  | .074 |
| 80.0                       | .192               | .223  | .096                | .096 | 170.0          | .038               | -.002 | -.751               | .145 | .014                | .005  | .074 |
| 85.0                       | .192               | .095  | .095                | .095 | 175.0          | .015               | -.001 | -.759               | .145 | .009                | .002  | .074 |
| 90.0                       | .146               | -.016 | .092                | .092 | 180.0          | -.008              | -.002 | -.757               | .147 | .003                | .002  | .072 |



Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 30.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW   |                | NORMAL             | AXIAL | SIDE                | YAW   | PITCH               | ROLL  |
| 0              | .004               | 1.131 | .025                | -.014 | 90.0           | .175               | -.020 | .108                | -.002 | .073                | -.002 |
| 5.0            | .008               | 1.125 | .026                | -.014 | 95.0           | .170               | -.113 | .103                | -.001 | .076                | -.001 |
| 10.0           | .011               | 1.100 | .033                | -.014 | 100.0          | .165               | -.181 | .099                | .000  | .079                | .000  |
| 15.0           | .016               | 1.092 | .030                | -.014 | 105.0          | .164               | -.243 | .098                | .000  | .081                | .000  |
| 20.0           | .020               | 1.083 | .033                | -.016 | 110.0          | .165               | -.273 | .100                | .001  | .080                | .001  |
| 25.0           | .027               | 1.031 | .037                | -.020 | 115.0          | .172               | -.280 | .104                | .003  | .078                | .003  |
| 30.0           | .035               | 1.050 | .045                | -.020 | 120.0          | .176               | -.300 | .116                | .003  | .080                | .003  |
| 35.0           | .048               | 1.032 | .052                | -.018 | 125.0          | .173               | -.324 | .125                | .003  | .082                | .003  |
| 40.0           | .067               | 1.010 | .060                | -.014 | 130.0          | .172               | -.352 | .139                | .002  | .085                | .002  |
| 45.0           | .091               | .993  | .070                | -.009 | 135.0          | .165               | -.400 | .148                | .001  | .086                | .001  |
| 50.0           | .113               | .941  | .080                | .000  | 140.0          | .158               | -.461 | .156                | .000  | .082                | .000  |
| 55.0           | .131               | .873  | .090                | .002  | 145.0          | .150               | -.514 | .164                | .000  | .068                | .000  |
| 60.0           | .146               | .771  | .099                | .001  | 150.0          | .140               | -.552 | .171                | .000  | .044                | .000  |
| 65.0           | .160               | .642  | .107                | .032  | 155.0          | .125               | -.600 | .176                | .002  | .029                | .002  |
| 70.0           | .171               | .500  | .112                | .036  | 160.0          | .108               | -.641 | .180                | .009  | .017                | .009  |
| 75.0           | .180               | .340  | .116                | .039  | 165.0          | .086               | -.671 | .183                | .012  | .013                | .012  |
| 80.0           | .183               | .200  | .116                | .040  | 170.0          | .060               | -.700 | .185                | .006  | .012                | .006  |
| 85.0           | .181               | .082  | .113                | .042  | 175.0          | .030               | -.712 | .186                | .002  | .011                | .002  |
| 90.0           | .175               | -.020 | .108                | .043  | 180.0          | -.004              | -.710 | .187                | .002  | .009                | .002  |

\*\*\*AZIMUTH ANGLE = 35.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW   |                | NORMAL             | AXIAL | SIDE                | YAW   | PITCH               | ROLL  |
| 0              | .004               | 1.094 | .032                | -.017 | 90.0           | .157               | -.040 | .113                | -.003 | .065                | -.003 |
| 5.0            | .008               | 1.094 | .034                | -.014 | 95.0           | .153               | -.126 | .108                | -.002 | .067                | -.002 |
| 10.0           | .012               | 1.081 | .041                | -.014 | 100.0          | .151               | -.187 | .106                | .001  | .070                | .001  |
| 15.0           | .016               | 1.071 | .042                | -.014 | 105.0          | .151               | -.245 | .107                | .001  | .072                | .001  |
| 20.0           | .021               | 1.062 | .046                | -.015 | 110.0          | .152               | -.279 | .110                | .001  | .072                | .001  |
| 25.0           | .029               | 1.020 | .052                | -.017 | 115.0          | .157               | -.298 | .115                | .000  | .072                | .000  |
| 30.0           | .038               | 1.027 | .061                | -.016 | 120.0          | .159               | -.317 | .126                | .001  | .074                | .001  |
| 35.0           | .053               | 1.004 | .070                | -.013 | 125.0          | .155               | -.340 | .135                | .001  | .076                | .001  |
| 40.0           | .071               | .983  | .079                | -.008 | 130.0          | .153               | -.364 | .147                | .001  | .078                | .001  |
| 45.0           | .093               | .956  | .090                | .000  | 135.0          | .145               | -.400 | .156                | .001  | .079                | .001  |
| 50.0           | .112               | .900  | .101                | .009  | 140.0          | .138               | -.444 | .163                | .001  | .075                | .001  |
| 55.0           | .129               | .830  | .111                | .024  | 145.0          | .129               | -.520 | .170                | .002  | .065                | .002  |
| 60.0           | .142               | .728  | .119                | .034  | 150.0          | .119               | -.521 | .176                | .003  | .048                | .003  |
| 65.0           | .153               | .605  | .125                | .040  | 155.0          | .105               | -.560 | .180                | .005  | .036                | .005  |
| 70.0           | .162               | .466  | .128                | .043  | 160.0          | .090               | -.594 | .183                | .010  | .026                | .010  |
| 75.0           | .169               | .320  | .129                | .046  | 165.0          | .070               | -.637 | .186                | .012  | .021                | .012  |
| 80.0           | .170               | .187  | .126                | .046  | 170.0          | .048               | -.648 | .187                | .007  | .015                | .007  |
| 85.0           | .166               | .061  | .120                | .047  | 175.0          | .023               | -.650 | .188                | .003  | .008                | .003  |
| 90.0           | .157               | -.040 | .113                | .048  | 180.0          | -.005              | -.650 | .189                | .001  | .012                | .001  |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 40.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL |
| 0              | .004               | 1.058 | .039                | .017  | 90.0           | .140               | -.060 | .057                | -.004 | .053                | .053 |
| 5.0            | .009               | 1.063 | .042                | .024  | 95.0           | .136               | -.139 | .059                | -.003 | .054                | .054 |
| 10.0           | .013               | 1.062 | .049                | .032  | 100.0          | .137               | -.193 | .061                | -.003 | .056                | .056 |
| 15.0           | .017               | 1.051 | .054                | .037  | 105.0          | .138               | -.248 | .063                | -.003 | .060                | .060 |
| 20.0           | .023               | 1.041 | .060                | .038  | 110.0          | .139               | -.285 | .064                | -.003 | .063                | .063 |
| 25.0           | .031               | 1.010 | .068                | .039  | 115.0          | .142               | -.316 | .066                | -.001 | .067                | .067 |
| 30.0           | .041               | 1.004 | .078                | .038  | 120.0          | .142               | -.335 | .068                | -.001 | .070                | .070 |
| 35.0           | .058               | .977  | .088                | .033  | 125.0          | .138               | -.356 | .070                | -.000 | .073                | .073 |
| 40.0           | .076               | .956  | .098                | .029  | 130.0          | .134               | -.377 | .071                | .001  | .076                | .076 |
| 45.0           | .096               | .920  | .110                | .027  | 135.0          | .126               | -.400 | .072                | .001  | .077                | .077 |
| 50.0           | .112               | .860  | .122                | .039  | 140.0          | .118               | -.427 | .069                | .003  | .079                | .079 |
| 55.0           | .127               | .787  | .132                | .061  | 145.0          | .109               | -.526 | .062                | .004  | .080                | .080 |
| 60.0           | .138               | .685  | .139                | .073  | 150.0          | .085               | -.490 | .052                | .007  | .082                | .082 |
| 65.0           | .147               | .568  | .143                | .075  | 155.0          | .085               | -.521 | .043                | .008  | .084                | .084 |
| 70.0           | .153               | .433  | .144                | .068  | 160.0          | .072               | -.547 | .035                | .011  | .085                | .085 |
| 75.0           | .158               | .301  | .142                | .062  | 165.0          | .054               | -.565 | .029                | .012  | .086                | .086 |
| 80.0           | .158               | .175  | .137                | .058  | 170.0          | .036               | -.575 | .024                | .009  | .086                | .086 |
| 85.0           | .152               | .041  | .127                | .057  | 175.0          | .016               | -.584 | .019                | .005  | .086                | .086 |
| 90.0           | .140               | -.060 | .118                | .057  | 180.0          | -.006              | -.590 | .015                | .000  | .085                | .085 |

\*\*\*AZIMUTH ANGLE = 45.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL |
| 0              | .004               | 1.022 | .047                | .020  | 90.0           | .123               | -.080 | .050                | -.005 | .059                | .059 |
| 5.0            | .010               | 1.032 | .051                | .024  | 95.0           | .120               | -.152 | .051                | -.005 | .060                | .060 |
| 10.0           | .014               | 1.043 | .058                | .028  | 100.0          | .123               | -.200 | .052                | -.005 | .061                | .061 |
| 15.0           | .018               | 1.031 | .066                | .031  | 105.0          | .126               | -.251 | .054                | -.005 | .063                | .063 |
| 20.0           | .025               | 1.020 | .074                | .033  | 110.0          | .127               | -.292 | .057                | -.005 | .065                | .065 |
| 25.0           | .033               | 1.000 | .084                | .034  | 115.0          | .127               | -.334 | .060                | -.004 | .067                | .067 |
| 30.0           | .045               | .982  | .095                | .034  | 120.0          | .125               | -.353 | .063                | -.003 | .069                | .069 |
| 35.0           | .063               | .950  | .106                | .024  | 125.0          | .121               | -.373 | .065                | -.001 | .071                | .071 |
| 40.0           | .081               | .930  | .118                | .016  | 130.0          | .115               | -.390 | .065                | .001  | .073                | .073 |
| 45.0           | .099               | .884  | .131                | .011  | 135.0          | .107               | -.400 | .065                | .002  | .074                | .074 |
| 50.0           | .112               | .820  | .144                | .025  | 140.0          | .099               | -.410 | .063                | .005  | .076                | .076 |
| 55.0           | .125               | .744  | .154                | .025  | 145.0          | .089               | -.433 | .060                | .006  | .077                | .077 |
| 60.0           | .135               | .643  | .159                | .071  | 150.0          | .078               | -.460 | .056                | .011  | .078                | .078 |
| 65.0           | .141               | .531  | .161                | .074  | 155.0          | .066               | -.482 | .051                | .012  | .079                | .079 |
| 70.0           | .145               | .400  | .161                | .065  | 160.0          | .054               | -.500 | .045                | .012  | .080                | .080 |
| 75.0           | .147               | .282  | .156                | .057  | 165.0          | .039               | -.513 | .038                | .012  | .081                | .081 |
| 80.0           | .146               | .163  | .148                | .052  | 170.0          | .025               | -.513 | .031                | .011  | .080                | .080 |
| 85.0           | .138               | .021  | .135                | .050  | 175.0          | .010               | -.520 | .024                | .007  | .080                | .080 |
| 90.0           | .123               | -.080 | .124                | .050  | 180.0          | -.008              | -.531 | .018                | .000  | .080                | .080 |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 50.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW   |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | .005               | .969  | .077                | -.002 | 90.0           | .109               | -.066 | .043                | .000  | .043                | .000  |
| 5.0            | .011               | .976  | .078                | .000  | 95.0           | .106               | -.144 | .045                | .000  | .045                | .000  |
| 10.0           | .017               | .979  | .083                | .002  | 100.0          | .107               | -.194 | .046                | .000  | .046                | .000  |
| 15.0           | .022               | .965  | .090                | .004  | 105.0          | .108               | -.238 | .048                | .000  | .048                | .000  |
| 20.0           | .029               | .950  | .099                | .005  | 110.0          | .107               | -.271 | .050                | .000  | .050                | .000  |
| 25.0           | .037               | .930  | .110                | .006  | 115.0          | .107               | -.310 | .051                | .000  | .051                | .000  |
| 30.0           | .049               | .909  | .120                | .010  | 120.0          | .105               | -.326 | .052                | .001  | .052                | .001  |
| 35.0           | .065               | .880  | .129                | .015  | 125.0          | .102               | -.342 | .051                | .003  | .051                | .003  |
| 40.0           | .081               | .850  | .138                | .026  | 130.0          | .097               | -.355 | .050                | .004  | .050                | .004  |
| 45.0           | .096               | .802  | .148                | .040  | 135.0          | .092               | -.364 | .048                | .005  | .048                | .005  |
| 50.0           | .106               | .740  | .157                | .050  | 140.0          | .086               | -.370 | .044                | .007  | .044                | .007  |
| 55.0           | .116               | .671  | .164                | .060  | 145.0          | .078               | -.452 | .041                | .008  | .041                | .008  |
| 60.0           | .123               | .580  | .167                | .067  | 150.0          | .069               | -.403 | .036                | .012  | .036                | .012  |
| 65.0           | .127               | .484  | .168                | .069  | 155.0          | .059               | -.415 | .031                | .011  | .031                | .011  |
| 70.0           | .129               | .371  | .167                | .070  | 160.0          | .048               | -.427 | .027                | .010  | .027                | .010  |
| 75.0           | .129               | .265  | .162                | .071  | 165.0          | .035               | -.436 | .022                | .009  | .022                | .009  |
| 80.0           | .127               | .165  | .156                | .070  | 170.0          | .022               | -.435 | .018                | .008  | .018                | .008  |
| 85.0           | .121               | .000  | .145                | .069  | 175.0          | .009               | -.440 | .014                | .004  | .014                | .004  |
| 90.0           | .109               | -.066 | .137                | .069  | 180.0          | -.008              | -.448 | .012                | -.001 | .012                | -.001 |

\*\*\*AZIMUTH ANGLE = 55.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | .006               | .916  | .107                | .011 | 90.0           | .096               | -.053 | .037                | .005  | .037                | .005  |
| 5.0            | .013               | .920  | .105                | .016 | 95.0           | .093               | -.137 | .039                | .005  | .039                | .005  |
| 10.0           | .020               | .915  | .109                | .019 | 100.0          | .091               | -.188 | .040                | .005  | .040                | .005  |
| 15.0           | .026               | .899  | .115                | .022 | 105.0          | .090               | -.225 | .042                | .005  | .042                | .005  |
| 20.0           | .033               | .880  | .124                | .024 | 110.0          | .088               | -.251 | .043                | .005  | .043                | .005  |
| 25.0           | .042               | .861  | .136                | .025 | 115.0          | .087               | -.286 | .042                | .005  | .042                | .005  |
| 30.0           | .054               | .836  | .145                | .028 | 120.0          | .085               | -.299 | .041                | .005  | .041                | .005  |
| 35.0           | .068               | .810  | .152                | .034 | 125.0          | .083               | -.312 | .038                | .007  | .038                | .007  |
| 40.0           | .082               | .770  | .159                | .048 | 130.0          | .080               | -.320 | .035                | .007  | .035                | .007  |
| 45.0           | .093               | .721  | .165                | .064 | 135.0          | .077               | -.328 | .031                | .008  | .031                | .008  |
| 50.0           | .101               | .661  | .170                | .071 | 140.0          | .073               | -.331 | .025                | .009  | .025                | .009  |
| 55.0           | .107               | .598  | .174                | .077 | 145.0          | .067               | -.347 | .022                | .011  | .022                | .011  |
| 60.0           | .111               | .517  | .175                | .081 | 150.0          | .060               | -.348 | .016                | .013  | .016                | .013  |
| 65.0           | .113               | .437  | .175                | .082 | 155.0          | .052               | -.355 | .011                | .011  | .011                | .011  |
| 70.0           | .113               | .342  | .173                | .082 | 160.0          | .043               | -.355 | .009                | .009  | .009                | .009  |
| 75.0           | .112               | .244  | .168                | .081 | 165.0          | .032               | -.358 | .006                | .007  | .006                | .007  |
| 80.0           | .109               | .168  | .164                | .081 | 170.0          | .020               | -.359 | .005                | .005  | .005                | .005  |
| 85.0           | .104               | -.019 | .156                | .079 | 175.0          | .009               | -.360 | .004                | .001  | .004                | .001  |
| 90.0           | .096               | -.053 | .150                | .079 | 180.0          | -.009              | -.365 | .006                | -.003 | .006                | -.003 |

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Table A-3 cont'd

| ***AZIMUTH ANGLE = 60.0**** |                    |       |                     |       |                |                    |       |                     |       |                     |       |       |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | PITCH               | ROLL  | YAW   |
| 0                           | .008               | .863  | .138                | .024  | 90.0           | .083               | -.040 | .164                | .031  |                     | .010  | .090  |
| 5.0                         | .015               | .864  | .133                | .041  | 95.0           | .080               | -.130 | .162                | .033  |                     | .010  | .090  |
| 10.0                        | .023               | .851  | .135                | .050  | 100.0          | .075               | -.182 | .162                | .035  |                     | .010  | .092  |
| 15.0                        | .030               | .833  | .140                | .056  | 105.0          | .072               | -.212 | .163                | .037  |                     | .010  | .095  |
| 20.0                        | .037               | .810  | .149                | .058  | 110.0          | .069               | -.231 | .167                | .036  |                     | .010  | .098  |
| 25.0                        | .047               | .792  | .162                | .059  | 115.0          | .067               | -.263 | .172                | .034  |                     | .010  | 1.020 |
| 30.0                        | .059               | .764  | .170                | .059  | 120.0          | .065               | -.272 | .176                | .030  |                     | .010  | .107  |
| 35.0                        | .071               | .741  | .175                | .057  | 125.0          | .064               | -.282 | .182                | .025  |                     | .011  | .110  |
| 40.0                        | .083               | .691  | .180                | .053  | 130.0          | .063               | -.285 | .187                | .020  |                     | .011  | .113  |
| 45.0                        | .091               | .640  | .182                | .048  | 135.0          | .062               | -.292 | .192                | .014  |                     | .012  | .117  |
| 50.0                        | .096               | .582  | .184                | .043  | 140.0          | .060               | -.292 | .195                | .007  |                     | .011  | .119  |
| 55.0                        | .098               | .525  | .184                | .038  | 145.0          | .057               | -.291 | .199                | .003  |                     | .014  | .121  |
| 60.0                        | .099               | .454  | .184                | .033  | 150.0          | .052               | -.291 | .203                | -.004 |                     | .014  | .122  |
| 65.0                        | .099               | .390  | .182                | .029  | 155.0          | .046               | -.282 | .207                | -.009 |                     | .011  | .123  |
| 70.0                        | .097               | .313  | .179                | .027  | 160.0          | .038               | -.283 | .211                | -.009 |                     | .008  | .124  |
| 75.0                        | .095               | .231  | .175                | .026  | 165.0          | .029               | -.282 | .216                | -.009 |                     | .005  | .125  |
| 80.0                        | .091               | .171  | .172                | .027  | 170.0          | .018               | -.281 | .219                | -.008 |                     | .002  | .126  |
| 85.0                        | .087               | -.040 | .167                | .028  | 175.0          | .007               | -.281 | .221                | -.006 |                     | -.002 | .126  |
| 90.0                        | .083               | -.040 | .164                | .031  | 180.0          | -.010              | -.282 | .223                | .000  |                     | -.005 | .125  |
| ***AZIMUTH ANGLE = 65.0**** |                    |       |                     |       |                |                    |       |                     |       |                     |       |       |
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH | PITCH               | ROLL  | YAW   |
| 0                           | .008               | .726  | .165                | .016  | 90.0           | .069               | -.040 | .165                | .021  |                     | .005  | .090  |
| 5.0                         | .014               | .722  | .160                | .035  | 95.0           | .066               | -.110 | .164                | .021  |                     | .005  | .089  |
| 10.0                        | .020               | .707  | .160                | .047  | 100.0          | .063               | -.151 | .164                | .021  |                     | .005  | .091  |
| 15.0                        | .026               | .692  | .162                | .055  | 105.0          | .061               | -.174 | .165                | .022  |                     | .005  | .093  |
| 20.0                        | .032               | .670  | .167                | .058  | 110.0          | .059               | -.194 | .168                | .021  |                     | .005  | .095  |
| 25.0                        | .040               | .652  | .176                | .059  | 115.0          | .057               | -.222 | .172                | .020  |                     | .005  | .101  |
| 30.0                        | .049               | .622  | .181                | .059  | 120.0          | .055               | -.231 | .176                | .016  |                     | .005  | .101  |
| 35.0                        | .059               | .601  | .185                | .056  | 125.0          | .054               | -.241 | .180                | .013  |                     | .006  | .103  |
| 40.0                        | .068               | .558  | .189                | .048  | 130.0          | .052               | -.247 | .185                | .009  |                     | .006  | .106  |
| 45.0                        | .074               | .514  | .189                | .044  | 135.0          | .051               | -.255 | .189                | .005  |                     | .008  | .108  |
| 50.0                        | .077               | .466  | .189                | .044  | 140.0          | .048               | -.259 | .191                | .000  |                     | .008  | .110  |
| 55.0                        | .078               | .416  | .186                | .044  | 145.0          | .045               | -.258 | .194                | -.002 |                     | .011  | .111  |
| 60.0                        | .078               | .361  | .184                | .043  | 150.0          | .041               | -.258 | .197                | -.007 |                     | .011  | .112  |
| 65.0                        | .078               | .304  | .181                | .038  | 155.0          | .036               | -.254 | .200                | -.011 |                     | .010  | .113  |
| 70.0                        | .077               | .239  | .177                | .031  | 160.0          | .029               | -.255 | .203                | -.011 |                     | .008  | .114  |
| 75.0                        | .076               | .170  | .173                | .022  | 165.0          | .021               | -.254 | .206                | -.010 |                     | .005  | .115  |
| 80.0                        | .073               | .118  | .171                | .021  | 170.0          | .012               | -.258 | .208                | -.009 |                     | .002  | .116  |
| 85.0                        | .071               | -.040 | .167                | .020  | 175.0          | .003               | -.258 | .209                | -.007 |                     | -.002 | .116  |
| 90.0                        | .069               | -.040 | .165                | .021  | 180.0          | -.009              | -.254 | .210                | -.003 |                     | -.005 | .115  |

Table A-3 cont'd

\*\*\*\*AZIMUTH ANGLE = 70.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  |
|----------------|-----------------|-----------------------------|------|------------------------------|-------|------|----------------|-----------------|-----------------------------|------|------------------------------|------|------|
| 0              | .008            | .590                        | .192 | .008                         | -.011 | .076 | 90.0           | .055            | -.040                       | .166 | .011                         | .000 | .090 |
| 5.0            | .014            | .581                        | .187 | .030                         | .009  | .078 | 95.0           | .053            | -.090                       | .166 | .009                         | .000 | .089 |
| 10.0           | .017            | .564                        | .185 | .044                         | .017  | .080 | 100.0          | .051            | -.121                       | .166 | .008                         | .000 | .090 |
| 15.0           | .022            | .551                        | .184 | .054                         | .021  | .086 | 105.0          | .050            | -.137                       | .167 | .008                         | .000 | .091 |
| 20.0           | .027            | .530                        | .186 | .058                         | .020  | .085 | 110.0          | .049            | -.157                       | .169 | .007                         | .000 | .092 |
| 25.0           | .033            | .512                        | .190 | .059                         | .009  | .086 | 115.0          | .048            | -.181                       | .173 | .006                         | .000 | .400 |
| 30.0           | .040            | .481                        | .192 | .059                         | .008  | .088 | 120.0          | .046            | -.191                       | .176 | .003                         | .000 | .096 |
| 35.0           | .047            | .461                        | .195 | .055                         | .011  | .089 | 125.0          | .044            | -.201                       | .179 | .001                         | .001 | .097 |
| 40.0           | .053            | .425                        | .198 | .044                         | .014  | .096 | 130.0          | .042            | -.210                       | .183 | .004                         | .002 | .100 |
| 45.0           | .057            | .388                        | .196 | .041                         | .008  | .098 | 135.0          | .040            | -.218                       | .186 | .004                         | .004 | .101 |
| 50.0           | .059            | .350                        | .194 | .045                         | .010  | .101 | 140.0          | .037            | -.226                       | .188 | .007                         | .005 | .102 |
| 55.0           | .058            | .308                        | .189 | .050                         | .014  | .104 | 145.0          | .034            | -.225                       | .190 | .008                         | .008 | .103 |
| 60.0           | .057            | .268                        | .184 | .053                         | .015  | .107 | 150.0          | .030            | -.225                       | .192 | .011                         | .009 | .104 |
| 65.0           | .057            | .218                        | .180 | .047                         | .012  | .105 | 155.0          | .026            | -.227                       | .194 | .013                         | .009 | .104 |
| 70.0           | .057            | .165                        | .175 | .035                         | .007  | .096 | 160.0          | .020            | -.227                       | .195 | .013                         | .008 | .104 |
| 75.0           | .057            | .110                        | .171 | .019                         | .004  | .093 | 165.0          | .013            | -.227                       | .196 | .012                         | .006 | .105 |
| 80.0           | .056            | .065                        | .170 | .015                         | .002  | .093 | 170.0          | .007            | -.235                       | .197 | .011                         | .002 | .106 |
| 85.0           | .055            | -.041                       | .168 | .013                         | .001  | .090 | 175.0          | .000            | -.235                       | .197 | .009                         | .002 | .106 |
| 90.0           | .055            | -.040                       | .166 | .011                         | .000  | .090 | 180.0          | -.008           | -.227                       | .197 | .006                         | .005 | .105 |

\*\*\*\*AZIMUTH ANGLE = 75.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL | YAW  |
|----------------|-----------------|-----------------------------|------|------------------------------|-------|------|----------------|-----------------|-----------------------------|------|------------------------------|------|------|
| 0              | .009            | .454                        | .220 | .000                         | -.015 | .102 | 90.0           | .041            | -.040                       | .168 | .001                         | .004 | .090 |
| 5.0            | .014            | .440                        | .215 | .025                         | .004  | .101 | 95.0           | .040            | -.071                       | .168 | .002                         | .005 | .089 |
| 10.0           | .015            | .421                        | .210 | .042                         | .010  | .102 | 100.0          | .040            | -.091                       | .168 | .005                         | .005 | .089 |
| 15.0           | .019            | .410                        | .207 | .053                         | .015  | .109 | 105.0          | .040            | -.100                       | .169 | .006                         | .005 | .089 |
| 20.0           | .023            | .391                        | .205 | .058                         | .017  | .106 | 110.0          | .039            | -.120                       | .171 | .007                         | .005 | .089 |
| 25.0           | .027            | .373                        | .204 | .060                         | .016  | .108 | 115.0          | .039            | -.141                       | .174 | .008                         | .005 | .090 |
| 30.0           | .031            | .340                        | .204 | .050                         | .016  | .110 | 120.0          | .037            | -.151                       | .176 | .010                         | .004 | .091 |
| 35.0           | .035            | .322                        | .206 | .054                         | .016  | .107 | 125.0          | .035            | -.161                       | .178 | .011                         | .003 | .091 |
| 40.0           | .038            | .292                        | .208 | .040                         | .014  | .109 | 130.0          | .032            | -.173                       | .181 | .012                         | .002 | .092 |
| 45.0           | .040            | .262                        | .204 | .038                         | .003  | .103 | 135.0          | .029            | -.181                       | .183 | .013                         | .000 | .092 |
| 50.0           | .041            | .234                        | .199 | .040                         | .007  | .105 | 140.0          | .026            | -.193                       | .185 | .014                         | .002 | .093 |
| 55.0           | .038            | .200                        | .192 | .056                         | .012  | .109 | 145.0          | .023            | -.192                       | .186 | .014                         | .005 | .094 |
| 60.0           | .037            | .176                        | .185 | .064                         | .014  | .113 | 150.0          | .019            | -.193                       | .187 | .015                         | .007 | .095 |
| 65.0           | .037            | .133                        | .179 | .056                         | .010  | .111 | 155.0          | .016            | -.200                       | .188 | .015                         | .009 | .095 |
| 70.0           | .037            | .092                        | .174 | .040                         | .003  | .098 | 160.0          | .011            | -.200                       | .188 | .015                         | .009 | .095 |
| 75.0           | .038            | .050                        | .170 | .037                         | .000  | .094 | 165.0          | .006            | -.200                       | .187 | .014                         | .007 | .096 |
| 80.0           | .039            | .012                        | .169 | .016                         | .002  | .094 | 170.0          | .002            | -.212                       | .186 | .013                         | .002 | .096 |
| 85.0           | .040            | -.042                       | .169 | .006                         | .003  | .091 | 175.0          | -.004           | -.213                       | .186 | .011                         | .002 | .096 |
| 90.0           | .041            | -.040                       | .168 | .001                         | .004  | .090 | 180.0          | -.008           | -.200                       | .184 | .010                         | .005 | .095 |

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Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 80.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | COEFFICIENTS |      | SIDE | MOMENT COEFFICIENTS |       | PITCH | ROLL  |      | YAW |
|----------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------|------|------|---------------------|-------|-------|-------|------|-----|
|                | NORMAL             | AXIAL | AXIAL               | SIDE |                |                 | AXIAL        | SIDE |      | PITCH               | ROLL  |       | ROLL  | YAW  |     |
| 0              | .006               | .260  | .202                |      | 90.0           | .029            | -.053        | .165 |      | -.003               | -.003 |       | -.003 | .082 |     |
| 5.0            | .010               | .253  | .198                |      | 95.0           | .028            | -.075        | .165 |      | -.003               | -.003 |       | -.003 | .081 |     |
| 10.0           | .011               | .240  | .195                |      | 100.0          | .026            | -.087        | .165 |      | -.003               | -.004 |       | -.004 | .081 |     |
| 15.0           | .014               | .233  | .193                |      | 105.0          | .025            | -.094        | .166 |      | -.002               | -.004 |       | -.004 | .081 |     |
| 20.0           | .016               | .223  | .191                |      | 110.0          | .025            | -.107        | .167 |      | -.002               | -.004 |       | -.004 | .082 |     |
| 25.0           | .018               | .211  | .191                |      | 115.0          | .026            | -.121        | .168 |      | -.002               | -.005 |       | -.005 | .084 |     |
| 30.0           | .020               | .190  | .191                |      | 120.0          | .026            | -.130        | .170 |      | -.004               | -.004 |       | -.004 | .085 |     |
| 35.0           | .023               | .181  | .192                |      | 125.0          | .025            | -.137        | .172 |      | -.005               | -.004 |       | -.004 | .085 |     |
| 40.0           | .026               | .163  | .193                |      | 130.0          | .021            | -.145        | .174 |      | -.006               | -.003 |       | -.003 | .086 |     |
| 45.0           | .027               | .144  | .190                |      | 135.0          | .017            | -.150        | .176 |      | -.008               | -.002 |       | -.002 | .086 |     |
| 50.0           | .028               | .127  | .186                |      | 140.0          | .015            | -.159        | .178 |      | -.011               | -.000 |       | -.000 | .086 |     |
| 55.0           | .025               | .105  | .181                |      | 145.0          | .013            | -.161        | .179 |      | -.018               | -.001 |       | -.001 | .087 |     |
| 60.0           | .024               | .087  | .176                |      | 150.0          | .013            | -.163        | .179 |      | -.021               | -.003 |       | -.003 | .089 |     |
| 65.0           | .024               | .061  | .172                |      | 155.0          | .011            | -.170        | .180 |      | -.022               | -.005 |       | -.005 | .090 |     |
| 70.0           | .024               | .033  | .169                |      | 160.0          | .006            | -.170        | .180 |      | -.022               | -.006 |       | -.006 | .091 |     |
| 75.0           | .026               | .005  | .167                |      | 165.0          | .002            | -.173        | .180 |      | -.020               | -.005 |       | -.005 | .092 |     |
| 80.0           | .027               | -.018 | .166                |      | 170.0          | .000            | -.181        | .179 |      | -.018               | -.002 |       | -.002 | .092 |     |
| 85.0           | .026               | -.055 | .166                |      | 175.0          | -.003           | -.182        | .179 |      | -.014               | -.001 |       | -.001 | .092 |     |
| 90.0           | .029               | -.053 | .165                |      | 180.0          | -.005           | -.176        | .178 |      | -.010               | -.002 |       | -.002 | .092 |     |

\*\*\*AZIMUTH ANGLE = 85.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | COEFFICIENTS |      | SIDE | MOMENT COEFFICIENTS |       | PITCH | ROLL  |      | YAW |
|----------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------|------|------|---------------------|-------|-------|-------|------|-----|
|                | NORMAL             | AXIAL | AXIAL               | SIDE |                |                 | AXIAL        | SIDE |      | PITCH               | ROLL  |       | ROLL  | YAW  |     |
| 0              | .004               | .066  | .184                |      | 90.0           | .017            | -.066        | .162 |      | -.007               | -.002 |       | -.002 | .074 |     |
| 5.0            | .006               | .066  | .182                |      | 95.0           | .016            | -.079        | .162 |      | -.004               | -.002 |       | -.002 | .074 |     |
| 10.0           | .007               | .060  | .180                |      | 100.0          | .013            | -.083        | .162 |      | -.001               | -.003 |       | -.003 | .074 |     |
| 15.0           | .009               | .056  | .179                |      | 105.0          | .011            | -.088        | .163 |      | -.002               | -.003 |       | -.003 | .074 |     |
| 20.0           | .010               | .055  | .178                |      | 110.0          | .011            | -.095        | .163 |      | -.002               | -.004 |       | -.004 | .075 |     |
| 25.0           | .010               | .050  | .178                |      | 115.0          | .014            | -.101        | .163 |      | -.002               | -.005 |       | -.005 | .078 |     |
| 30.0           | .010               | .040  | .178                |      | 120.0          | .015            | -.110        | .164 |      | -.002               | -.005 |       | -.005 | .079 |     |
| 35.0           | .011               | .040  | .178                |      | 125.0          | .015            | -.113        | .166 |      | -.001               | -.005 |       | -.005 | .079 |     |
| 40.0           | .014               | .035  | .178                |      | 130.0          | .010            | -.118        | .168 |      | -.000               | -.005 |       | -.005 | .080 |     |
| 45.0           | .015               | .027  | .176                |      | 135.0          | .006            | -.120        | .170 |      | -.003               | -.004 |       | -.004 | .080 |     |
| 50.0           | .015               | .020  | .174                |      | 140.0          | .005            | -.126        | .171 |      | -.009               | -.003 |       | -.003 | .080 |     |
| 55.0           | .012               | .010  | .170                |      | 145.0          | .004            | -.130        | .172 |      | -.022               | -.001 |       | -.001 | .082 |     |
| 60.0           | .011               | .000  | .167                |      | 150.0          | .007            | -.134        | .172 |      | -.027               | -.000 |       | -.000 | .084 |     |
| 65.0           | .011               | -.010 | .165                |      | 155.0          | .006            | -.140        | .172 |      | -.029               | .001  |       | .001  | .085 |     |
| 70.0           | .012               | -.024 | .164                |      | 160.0          | .001            | -.141        | .173 |      | -.029               | .003  |       | .003  | .087 |     |
| 75.0           | .014               | -.038 | .164                |      | 165.0          | -.001           | -.147        | .173 |      | -.026               | .003  |       | .003  | .088 |     |
| 80.0           | .014               | -.049 | .163                |      | 170.0          | -.001           | -.150        | .172 |      | -.023               | .002  |       | .002  | .089 |     |
| 85.0           | .016               | -.069 | .163                |      | 175.0          | -.002           | -.151        | .172 |      | -.017               | .004  |       | .004  | .089 |     |
| 90.0           | .017               | -.066 | .162                |      | 180.0          | -.002           | -.153        | .172 |      | -.011               | .010  |       | .010  | .089 |     |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 90.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| 0              | .002               | -.127 | .166                | .087 | 90.0           | .005               | -.080 | .160                | .066 | -.011               | -.001 |
| 5.0            | .003               | -.121 | .166                | .086 | 95.0           | .004               | -.083 | .160                | .067 | -.006               | -.001 |
| 10.0           | .004               | -.120 | .165                | .085 | 100.0          | .000               | -.080 | .160                | .067 | .001                | -.002 |
| 15.0           | .005               | -.121 | .166                | .083 | 105.0          | -.003              | -.083 | .160                | .067 | .006                | -.003 |
| 20.0           | .004               | -.112 | .165                | .082 | 110.0          | -.002              | -.083 | .160                | .069 | .007                | -.004 |
| 25.0           | .002               | -.111 | .165                | .081 | 115.0          | .002               | -.082 | .158                | .072 | .008                | -.005 |
| 30.0           | .000               | -.110 | .165                | .080 | 120.0          | .005               | -.090 | .158                | .074 | .008                | -.006 |
| 35.0           | .000               | -.100 | .164                | .077 | 125.0          | .005               | -.090 | .160                | .074 | .007                | -.007 |
| 40.0           | .002               | -.093 | .164                | .076 | 130.0          | .000               | -.091 | .162                | .074 | .006                | -.007 |
| 45.0           | .003               | -.090 | .163                | .075 | 135.0          | -.005              | -.090 | .164                | .074 | .002                | -.007 |
| 50.0           | .003               | -.086 | .162                | .075 | 140.0          | -.005              | -.093 | .165                | .075 | -.007               | -.006 |
| 55.0           | .000               | -.085 | .160                | .076 | 145.0          | -.005              | -.100 | .165                | .077 | -.026               | -.005 |
| 60.0           | -.002              | -.089 | .158                | .077 | 150.0          | .001               | -.105 | .165                | .080 | -.034               | -.003 |
| 65.0           | -.001              | -.082 | .158                | .075 | 155.0          | .001               | -.111 | .165                | .081 | -.036               | -.002 |
| 70.0           | .000               | -.083 | .159                | .072 | 160.0          | -.003              | -.112 | .166                | .083 | -.036               | .000  |
| 75.0           | .003               | -.080 | .161                | .070 | 165.0          | -.005              | -.120 | .166                | .084 | -.033               | .001  |
| 80.0           | .005               | -.083 | .161                | .068 | 170.0          | -.003              | -.121 | .166                | .086 | -.028               | .003  |
| 85.0           | .005               | -.083 | .161                | .067 | 175.0          | -.002              | -.121 | .166                | .086 | -.020               | .008  |
| 90.0           | .005               | -.080 | .160                | .066 | 180.0          | .000               | -.130 | .166                | .087 | -.012               | .018  |

\*\*\*AZIMUTH ANGLE = 95.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| 0              | .004               | -.151 | .172                | .089 | 90.0           | -.010              | -.066 | .162                | .074 | -.007               | -.002 |
| 5.0            | .003               | -.151 | .172                | .089 | 95.0           | -.010              | -.069 | .163                | .075 | -.006               | -.001 |
| 10.0           | .002               | -.150 | .172                | .088 | 100.0          | -.013              | -.049 | .163                | .076 | -.002               | -.002 |
| 15.0           | .001               | -.147 | .173                | .087 | 105.0          | -.014              | -.038 | .163                | .076 | -.001               | -.002 |
| 20.0           | -.001              | -.141 | .172                | .086 | 110.0          | -.013              | -.024 | .164                | .078 | -.008               | -.001 |
| 25.0           | -.004              | -.140 | .172                | .085 | 115.0          | -.011              | -.010 | .165                | .085 | -.013               | .000  |
| 30.0           | -.006              | -.137 | .172                | .084 | 120.0          | -.009              | -.001 | .167                | .087 | -.016               | .000  |
| 35.0           | -.007              | -.130 | .171                | .082 | 125.0          | -.009              | .016  | .170                | .085 | -.014               | .000  |
| 40.0           | -.007              | -.126 | .171                | .081 | 130.0          | -.013              | .017  | .174                | .084 | -.011               | -.002 |
| 45.0           | -.007              | -.120 | .169                | .080 | 135.0          | -.016              | .027  | .177                | .083 | -.011               | -.003 |
| 50.0           | -.008              | -.115 | .168                | .080 | 140.0          | -.016              | .035  | .179                | .086 | -.018               | .000  |
| 55.0           | -.011              | -.110 | .166                | .081 | 145.0          | -.015              | .040  | .178                | .087 | -.035               | .002  |
| 60.0           | -.013              | -.109 | .164                | .081 | 150.0          | -.009              | .043  | .178                | .090 | -.042               | .003  |
| 65.0           | -.013              | -.101 | .163                | .080 | 155.0          | -.008              | .050  | .178                | .090 | -.044               | .004  |
| 70.0           | -.013              | -.095 | .163                | .077 | 160.0          | -.009              | .055  | .179                | .090 | -.043               | .005  |
| 75.0           | -.011              | -.088 | .163                | .076 | 165.0          | -.009              | .056  | .179                | .092 | -.039               | .005  |
| 80.0           | -.010              | -.083 | .163                | .075 | 170.0          | -.007              | .060  | .180                | .091 | -.032               | .005  |
| 85.0           | -.010              | -.079 | .163                | .074 | 175.0          | -.006              | .066  | .182                | .091 | -.021               | .006  |
| 90.0           | -.010              | -.066 | .162                | .074 | 180.0          | -.003              | .064  | .184                | .092 | -.008               | .007  |

Table A-3 cont'd

| ***AZIMUTH ANGLE = 100.0*** |                    |       |                     |      |                |                    |       |                     |       |                     |       |      |
|-----------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |      |
| 0                           | .006               | -.175 | .178                | .092 | 90.0           | -.025              | -.053 | -.004               | -.003 | -.004               | -.003 | .082 |
| 5.0                         | .003               | -.182 | .179                | .092 | 95.0           | -.025              | -.055 | -.006               | -.002 | -.006               | -.002 | .083 |
| 10.0                        | .000               | -.181 | .179                | .092 | 100.0          | -.026              | -.018 | -.006               | -.002 | -.006               | -.002 | .085 |
| 15.0                        | -.002              | -.173 | .180                | .091 | 105.0          | -.026              | .005  | -.008               | -.001 | -.008               | -.001 | .085 |
| 20.0                        | -.006              | -.170 | .180                | .090 | 110.0          | -.025              | .033  | -.024               | .000  | -.024               | .000  | .088 |
| 25.0                        | -.010              | -.170 | .180                | .090 | 115.0          | -.024              | .061  | -.034               | .005  | -.034               | .005  | .098 |
| 30.0                        | -.012              | -.165 | .179                | .089 | 120.0          | -.023              | .087  | -.040               | .007  | -.040               | .007  | .100 |
| 35.0                        | -.015              | -.161 | .178                | .087 | 125.0          | -.023              | .057  | -.035               | .005  | -.035               | .005  | .097 |
| 40.0                        | -.016              | -.159 | .178                | .086 | 130.0          | -.027              | .125  | -.028               | .002  | -.028               | .002  | .094 |
| 45.0                        | -.018              | -.150 | .176                | .086 | 135.0          | -.028              | .144  | -.024               | .000  | -.024               | .000  | .093 |
| 50.0                        | -.020              | -.144 | .174                | .086 | 140.0          | -.027              | .163  | -.029               | .007  | -.029               | .007  | .097 |
| 55.0                        | -.023              | -.135 | .172                | .086 | 145.0          | -.025              | .181  | -.044               | .009  | -.044               | .009  | .097 |
| 60.0                        | -.025              | -.130 | .170                | .086 | 150.0          | -.020              | .191  | -.051               | .009  | -.051               | .009  | .100 |
| 65.0                        | -.026              | -.121 | .168                | .085 | 155.0          | -.017              | .211  | -.052               | .010  | -.052               | .010  | .099 |
| 70.0                        | -.026              | -.107 | .167                | .083 | 160.0          | -.016              | .223  | -.050               | .011  | -.050               | .011  | .098 |
| 75.0                        | -.025              | -.094 | .166                | .082 | 165.0          | -.014              | .233  | -.046               | .010  | -.046               | .010  | .100 |
| 80.0                        | -.025              | -.087 | .165                | .082 | 170.0          | -.011              | .240  | -.037               | .007  | -.037               | .007  | .096 |
| 85.0                        | -.025              | -.075 | .165                | .081 | 175.0          | -.010              | .253  | -.023               | .005  | -.023               | .005  | .096 |
| 90.0                        | -.025              | -.053 | .165                | .082 | 180.0          | -.006              | .259  | -.004               | -.004 | -.004               | -.004 | .097 |
| ***AZIMUTH ANGLE = 105.0*** |                    |       |                     |      |                |                    |       |                     |       |                     |       |      |
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW  |
|                             | NORMAL             | AXIAL | PITCH               | ROLL |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |      |
| 0                           | .008               | -.200 | .184                | .095 | 90.0           | -.041              | -.040 | -.001               | -.004 | -.001               | -.004 | .090 |
| 5.0                         | .004               | -.213 | .186                | .096 | 95.0           | -.040              | -.042 | -.006               | -.003 | -.006               | -.003 | .091 |
| 10.0                        | -.002              | -.212 | .186                | .096 | 100.0          | -.039              | .012  | -.010               | -.002 | -.010               | -.002 | .094 |
| 15.0                        | -.006              | -.200 | .187                | .096 | 105.0          | -.038              | .050  | -.016               | .000  | -.016               | .000  | .094 |
| 20.0                        | -.011              | -.200 | .188                | .095 | 110.0          | -.037              | .092  | -.040               | .003  | -.040               | .003  | .098 |
| 25.0                        | -.016              | -.200 | .188                | .095 | 115.0          | -.037              | .133  | -.056               | .010  | -.056               | .010  | .111 |
| 30.0                        | -.019              | -.193 | .187                | .094 | 120.0          | -.037              | .176  | -.064               | .014  | -.064               | .014  | .113 |
| 35.0                        | -.023              | -.192 | .186                | .093 | 125.0          | -.038              | .130  | -.056               | .012  | -.056               | .012  | .109 |
| 40.0                        | -.026              | -.193 | .185                | .092 | 130.0          | -.041              | .234  | -.046               | .007  | -.046               | .007  | .105 |
| 45.0                        | -.029              | -.161 | .183                | .092 | 135.0          | -.040              | .262  | -.038               | .003  | -.038               | .003  | .103 |
| 50.0                        | -.032              | -.173 | .181                | .092 | 140.0          | -.038              | .292  | -.040               | .014  | -.040               | .014  | .109 |
| 55.0                        | -.035              | -.161 | .178                | .091 | 145.0          | -.035              | .322  | -.054               | .016  | -.054               | .016  | .107 |
| 60.0                        | -.037              | -.151 | .176                | .091 | 150.0          | -.031              | .340  | -.060               | .016  | -.060               | .016  | .110 |
| 65.0                        | -.039              | -.141 | .174                | .090 | 155.0          | -.027              | .373  | -.060               | .016  | -.060               | .016  | .108 |
| 70.0                        | -.039              | -.120 | .171                | .089 | 160.0          | -.023              | .391  | -.058               | .015  | -.058               | .015  | .106 |
| 75.0                        | -.040              | -.100 | .169                | .089 | 165.0          | -.019              | .410  | -.053               | .015  | -.053               | .015  | .109 |
| 80.0                        | -.040              | -.091 | .168                | .089 | 170.0          | -.015              | .421  | -.042               | .010  | -.042               | .010  | .102 |
| 85.0                        | -.040              | -.071 | .168                | .089 | 175.0          | -.014              | .440  | -.025               | .004  | -.025               | .004  | .101 |
| 90.0                        | -.041              | -.040 | .168                | .090 | 180.0          | -.009              | .454  | -.000               | -.015 | -.000               | -.015 | .102 |

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Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 110.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| 0              | .008               | -.227 | .197                | .105 | 90.0           | -.055              | -.040 | .166                | .090 | -.011               | .000  |
| 5.0            | .000               | -.235 | .197                | .106 | 95.0           | -.055              | -.041 | .168                | .090 | -.013               | .001  |
| 10.0           | -.007              | -.235 | .197                | .106 | 100.0          | -.056              | .065  | .170                | .093 | -.015               | .002  |
| 15.0           | -.013              | -.227 | .196                | .105 | 105.0          | -.057              | .110  | .171                | .093 | -.019               | .004  |
| 20.0           | -.020              | -.227 | .195                | .104 | 110.0          | -.057              | .165  | .175                | .096 | -.035               | .007  |
| 25.0           | -.026              | -.227 | .194                | .104 | 115.0          | -.057              | .218  | .180                | .105 | -.047               | .012  |
| 30.0           | -.030              | -.225 | .192                | .103 | 120.0          | -.057              | .268  | .184                | .107 | -.053               | .015  |
| 35.0           | -.034              | -.225 | .190                | .102 | 125.0          | -.058              | .260  | .189                | .104 | -.050               | .014  |
| 40.0           | -.037              | -.226 | .188                | .101 | 130.0          | -.059              | .350  | .194                | .101 | -.045               | .010  |
| 45.0           | -.040              | -.218 | .186                | .100 | 135.0          | -.057              | .388  | .196                | .098 | -.041               | .008  |
| 50.0           | -.042              | -.210 | .183                | .100 | 140.0          | -.053              | .425  | .198                | .096 | -.044               | .014  |
| 55.0           | -.044              | -.201 | .179                | .097 | 145.0          | -.047              | .461  | .195                | .089 | -.055               | .011  |
| 60.0           | -.046              | -.191 | .176                | .096 | 150.0          | -.040              | .481  | .192                | .088 | -.059               | .008  |
| 65.0           | -.048              | -.162 | .173                | .094 | 155.0          | -.033              | .512  | .190                | .086 | -.059               | .009  |
| 70.0           | -.049              | -.157 | .169                | .092 | 160.0          | -.027              | .530  | .186                | .085 | -.058               | .020  |
| 75.0           | -.050              | -.137 | .167                | .091 | 165.0          | -.022              | .551  | .184                | .086 | -.054               | .021  |
| 80.0           | -.051              | -.121 | .166                | .090 | 170.0          | -.017              | .564  | .185                | .080 | -.044               | .017  |
| 85.0           | -.053              | -.090 | .166                | .089 | 175.0          | -.014              | .581  | .187                | .078 | -.030               | .009  |
| 90.0           | -.055              | -.040 | .166                | .090 | 180.0          | -.008              | .590  | .192                | .076 | -.008               | -.011 |

\*\*\*AZIMUTH ANGLE = 115.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| 0              | .009               | -.254 | .210                | .115 | 90.0           | -.069              | -.040 | .165                | .090 | -.021               | .005  |
| 5.0            | -.003              | -.258 | .209                | .116 | 95.0           | -.071              | -.040 | .167                | .090 | -.020               | .005  |
| 10.0           | -.012              | -.258 | .208                | .116 | 100.0          | -.073              | .118  | .171                | .092 | -.021               | .006  |
| 15.0           | -.021              | -.254 | .206                | .115 | 105.0          | -.076              | .170  | .173                | .093 | -.022               | .008  |
| 20.0           | -.029              | -.255 | .203                | .114 | 110.0          | -.077              | .239  | .177                | .095 | -.031               | .011  |
| 25.0           | -.036              | -.254 | .200                | .113 | 115.0          | -.078              | .304  | .181                | .100 | -.038               | .014  |
| 30.0           | -.041              | -.258 | .197                | .112 | 120.0          | -.078              | .361  | .184                | .101 | -.043               | .016  |
| 35.0           | -.045              | -.258 | .194                | .111 | 125.0          | -.078              | .390  | .186                | .099 | -.044               | .016  |
| 40.0           | -.045              | -.259 | .191                | .110 | 130.0          | -.077              | .466  | .189                | .097 | -.044               | .014  |
| 45.0           | -.051              | -.255 | .189                | .108 | 135.0          | -.074              | .514  | .189                | .093 | -.044               | .013  |
| 50.0           | -.052              | -.247 | .185                | .106 | 140.0          | -.068              | .558  | .189                | .083 | -.048               | .014  |
| 55.0           | -.054              | -.241 | .180                | .103 | 145.0          | -.059              | .601  | .185                | .071 | -.056               | .006  |
| 60.0           | -.055              | -.231 | .176                | .101 | 150.0          | -.049              | .622  | .181                | .067 | -.059               | .000  |
| 65.0           | -.057              | -.223 | .172                | .098 | 155.0          | -.040              | .652  | .176                | .065 | -.059               | .003  |
| 70.0           | -.059              | -.194 | .168                | .095 | 160.0          | -.032              | .670  | .167                | .064 | -.058               | .024  |
| 75.0           | -.061              | -.174 | .165                | .093 | 165.0          | -.026              | .692  | .162                | .063 | -.055               | .027  |
| 80.0           | -.063              | -.151 | .164                | .091 | 170.0          | -.020              | .707  | .160                | .058 | -.047               | .025  |
| 85.0           | -.066              | -.110 | .164                | .089 | 175.0          | -.014              | .722  | .160                | .055 | -.035               | .014  |
| 90.0           | -.069              | -.040 | .165                | .090 | 180.0          | -.008              | .726  | .165                | .050 | -.016               | -.007 |

Table A-3 cont'd

| ***AZIMUTH ANGLE = 120.0**** |                    |       |                     |       |                |                 |                    |      |                     |       |      |
|------------------------------|--------------------|-------|---------------------|-------|----------------|-----------------|--------------------|------|---------------------|-------|------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | YAW  |
|                              | NORMAL             | AXIAL | PITCH               | ROLL  |                |                 | AXIAL              | SIDE | PITCH               | ROLL  |      |
| 0                            | .010               | -.282 | .000                | -.005 | 90.0           | -.083           | -.040              | .164 | -.031               | .010  | .090 |
| 5.0                          | -.007              | -.281 | .006                | -.002 | 95.0           | -.087           | -.040              | .167 | -.028               | .010  | .090 |
| 10.0                         | -.018              | -.281 | .008                | .002  | 100.0          | -.091           | .171               | .172 | -.027               | .010  | .092 |
| 15.0                         | -.029              | -.282 | .009                | .005  | 105.0          | -.095           | .231               | .175 | -.026               | .012  | .093 |
| 20.0                         | -.038              | -.283 | .009                | .008  | 110.0          | -.097           | .313               | .179 | -.027               | .015  | .094 |
| 25.0                         | -.046              | -.282 | .009                | .011  | 115.0          | -.099           | .390               | .182 | -.029               | .016  | .095 |
| 30.0                         | -.052              | -.291 | .004                | .014  | 120.0          | -.099           | .454               | .184 | -.033               | .018  | .096 |
| 35.0                         | -.057              | -.291 | .007                | .014  | 125.0          | -.098           | .520               | .184 | -.038               | .018  | .095 |
| 40.0                         | -.060              | -.292 | .007                | .011  | 130.0          | -.096           | .582               | .184 | -.043               | .018  | .093 |
| 45.0                         | -.062              | -.292 | .007                | .012  | 135.0          | -.091           | .640               | .182 | -.048               | .018  | .088 |
| 50.0                         | -.063              | -.285 | .020                | .011  | 140.0          | -.083           | .691               | .180 | -.053               | .014  | .070 |
| 55.0                         | -.064              | -.282 | .025                | .011  | 145.0          | -.071           | .741               | .175 | -.057               | .002  | .054 |
| 60.0                         | -.065              | -.272 | .030                | .010  | 150.0          | -.059           | .764               | .170 | -.059               | -.008 | .046 |
| 65.0                         | -.067              | -.264 | .034                | .010  | 155.0          | -.047           | .792               | .162 | -.059               | -.003 | .044 |
| 70.0                         | -.069              | -.231 | .036                | .010  | 160.0          | -.037           | .810               | .149 | -.058               | .028  | .043 |
| 75.0                         | -.072              | -.212 | .037                | .010  | 165.0          | -.030           | .833               | .140 | -.056               | .034  | .041 |
| 80.0                         | -.075              | -.182 | .035                | .010  | 170.0          | -.023           | .851               | .135 | -.050               | .033  | .037 |
| 85.0                         | -.080              | -.150 | .033                | .010  | 175.0          | -.015           | .864               | .133 | -.041               | .020  | .032 |
| 90.0                         | -.063              | -.040 | .031                | .010  | 180.0          | -.008           | .863               | .138 | -.024               | -.004 | .024 |
| ***AZIMUTH ANGLE = 125.0**** |                    |       |                     |       |                |                 |                    |      |                     |       |      |
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | YAW  |
|                              | NORMAL             | AXIAL | PITCH               | ROLL  |                |                 | AXIAL              | SIDE | PITCH               | ROLL  |      |
| 0                            | .009               | -.365 | -.006               | -.003 | 90.0           | -.096           | -.053              | .150 | -.037               | .005  | .079 |
| 5.0                          | -.008              | -.360 | -.004               | .001  | 95.0           | -.104           | -.019              | .156 | -.035               | .005  | .079 |
| 10.0                         | -.020              | -.358 | -.005               | .005  | 100.0          | -.109           | .168               | .164 | -.035               | .005  | .081 |
| 15.0                         | -.032              | -.359 | -.006               | .007  | 105.0          | -.112           | .248               | .168 | -.036               | .007  | .082 |
| 20.0                         | -.043              | -.355 | -.009               | .009  | 110.0          | -.113           | .342               | .173 | -.039               | .009  | .082 |
| 25.0                         | -.052              | -.348 | -.023               | .011  | 115.0          | -.113           | .437               | .175 | -.044               | .010  | .082 |
| 30.0                         | -.060              | -.347 | -.016               | .013  | 120.0          | -.111           | .517               | .175 | -.045               | .011  | .081 |
| 35.0                         | -.067              | -.371 | -.022               | .011  | 125.0          | -.107           | .594               | .174 | -.043               | .010  | .077 |
| 40.0                         | -.073              | -.331 | -.025               | .009  | 130.0          | -.101           | .661               | .170 | -.037               | .010  | .071 |
| 45.0                         | -.077              | -.328 | -.031               | .008  | 135.0          | -.093           | .721               | .165 | -.035               | .009  | .064 |
| 50.0                         | -.080              | -.320 | -.035               | .007  | 140.0          | -.082           | .770               | .159 | -.040               | .006  | .048 |
| 55.0                         | -.083              | -.312 | -.038               | .007  | 145.0          | -.068           | .810               | .152 | -.046               | -.002 | .034 |
| 60.0                         | -.085              | -.294 | -.041               | .005  | 150.0          | -.054           | .836               | .145 | -.050               | -.009 | .028 |
| 65.0                         | -.087              | -.287 | -.042               | .005  | 155.0          | -.042           | .861               | .136 | -.050               | -.005 | .025 |
| 70.0                         | -.088              | -.251 | -.043               | .005  | 160.0          | -.033           | .880               | .124 | -.049               | .016  | .024 |
| 75.0                         | -.090              | -.225 | -.042               | .005  | 165.0          | -.026           | .899               | .115 | -.047               | .021  | .022 |
| 80.0                         | -.091              | -.188 | -.040               | .005  | 170.0          | -.020           | .915               | .109 | -.042               | .024  | .019 |
| 85.0                         | -.093              | -.157 | -.039               | .005  | 175.0          | -.013           | .920               | .105 | -.035               | .018  | .016 |
| 90.0                         | -.096              | -.053 | -.037               | .005  | 180.0          | -.006           | .916               | .107 | -.022               | .004  | .011 |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 130.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  | YAW   |
| 0              | .008               | -.448 | .204                | .095 | 90.0           | -.109              | -.066 | -.043               | -.000 | -.043               | -.000 | -.069 |
| 5.0            | -.009              | -.440 | .203                | .095 | 95.0           | -.121              | .000  | -.042               | -.000 | -.042               | -.000 | -.069 |
| 10.0           | -.022              | -.435 | .201                | .095 | 100.0          | -.127              | .165  | -.043               | -.000 | -.043               | -.000 | -.070 |
| 15.0           | -.035              | -.436 | .200                | .095 | 105.0          | -.129              | .265  | -.046               | -.002 | -.046               | -.002 | -.071 |
| 20.0           | -.048              | -.427 | .197                | .094 | 110.0          | -.129              | .371  | -.052               | .003  | -.052               | .003  | -.070 |
| 25.0           | -.059              | -.415 | .194                | .093 | 115.0          | -.127              | .484  | -.059               | .004  | -.059               | .004  | -.069 |
| 30.0           | -.069              | -.403 | .191                | .092 | 120.0          | -.123              | .580  | -.058               | .004  | -.058               | .004  | -.067 |
| 35.0           | -.078              | -.452 | .187                | .091 | 125.0          | -.116              | .667  | -.048               | .003  | -.048               | .003  | -.060 |
| 40.0           | -.086              | -.370 | .183                | .090 | 130.0          | -.106              | .740  | -.031               | .002  | -.031               | .002  | -.050 |
| 45.0           | -.092              | -.364 | .178                | .088 | 135.0          | -.096              | .802  | -.023               | .000  | -.023               | .000  | -.040 |
| 50.0           | -.097              | -.355 | .172                | .086 | 140.0          | -.081              | .850  | -.028               | -.002 | -.028               | -.002 | -.026 |
| 55.0           | -.102              | -.342 | .164                | .084 | 145.0          | -.065              | .880  | -.035               | -.007 | -.035               | -.007 | -.015 |
| 60.0           | -.105              | -.326 | .157                | .081 | 150.0          | -.049              | .909  | -.041               | -.010 | -.041               | -.010 | -.010 |
| 65.0           | -.107              | -.310 | .150                | .079 | 155.0          | -.037              | .930  | -.042               | -.008 | -.042               | -.008 | -.006 |
| 70.0           | -.107              | -.271 | .143                | .076 | 160.0          | -.029              | .950  | -.041               | .004  | -.041               | .004  | -.005 |
| 75.0           | -.108              | -.238 | .137                | .073 | 165.0          | -.022              | .965  | -.039               | .008  | -.039               | .008  | -.004 |
| 80.0           | -.107              | -.194 | .134                | .071 | 170.0          | -.017              | .979  | -.035               | .015  | -.035               | .015  | -.002 |
| 85.0           | -.106              | -.144 | .133                | .070 | 175.0          | -.011              | .976  | -.029               | .017  | -.029               | .017  | -.000 |
| 90.0           | -.109              | -.066 | .137                | .069 | 180.0          | -.005              | .969  | -.021               | .013  | -.021               | .013  | -.002 |

\*\*\*AZIMUTH ANGLE = 135.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  | YAW   |
| 0              | .008               | -.531 | .195                | .080 | 90.0           | -.123              | -.080 | -.050               | -.005 | -.050               | -.005 | .059  |
| 5.0            | -.010              | -.520 | .194                | .080 | 95.0           | -.138              | .021  | -.050               | -.004 | -.050               | -.004 | .059  |
| 10.0           | -.025              | -.513 | .193                | .080 | 100.0          | -.146              | .163  | -.052               | -.004 | -.052               | -.004 | .059  |
| 15.0           | -.039              | -.513 | .192                | .081 | 105.0          | -.147              | .282  | -.057               | -.002 | -.057               | -.002 | .061  |
| 20.0           | -.054              | -.500 | .191                | .080 | 110.0          | -.145              | .400  | -.065               | -.002 | -.065               | -.002 | .059  |
| 25.0           | -.066              | -.482 | .188                | .079 | 115.0          | -.141              | .531  | -.074               | -.002 | -.074               | -.002 | .057  |
| 30.0           | -.078              | -.460 | .186                | .078 | 120.0          | -.135              | .643  | -.071               | -.003 | -.071               | -.003 | .053  |
| 35.0           | -.089              | -.533 | .182                | .077 | 125.0          | -.125              | .741  | -.054               | -.004 | -.054               | -.004 | .043  |
| 40.0           | -.099              | -.410 | .177                | .076 | 130.0          | -.112              | .820  | -.025               | -.006 | -.025               | -.006 | .029  |
| 45.0           | -.107              | -.400 | .172                | .074 | 135.0          | -.099              | .884  | -.011               | -.008 | -.011               | -.008 | .016  |
| 50.0           | -.115              | -.390 | .165                | .073 | 140.0          | -.081              | .930  | -.016               | -.010 | -.016               | -.010 | .004  |
| 55.0           | -.121              | -.373 | .156                | .071 | 145.0          | -.063              | .950  | -.024               | -.012 | -.024               | -.012 | .004  |
| 60.0           | -.125              | -.353 | .148                | .069 | 150.0          | -.045              | .982  | -.033               | -.012 | -.033               | -.012 | -.008 |
| 65.0           | -.127              | -.333 | .139                | .067 | 155.0          | -.033              | 1.000 | -.034               | -.011 | -.034               | -.011 | -.013 |
| 70.0           | -.127              | -.292 | .131                | .065 | 160.0          | -.025              | 1.020 | -.033               | -.008 | -.033               | -.008 | -.013 |
| 75.0           | -.126              | -.251 | .125                | .063 | 165.0          | -.018              | 1.031 | -.031               | -.005 | -.031               | -.005 | -.014 |
| 80.0           | -.123              | -.200 | .120                | .061 | 170.0          | -.014              | 1.043 | -.028               | -.007 | -.028               | -.007 | -.015 |
| 85.0           | -.120              | -.152 | .119                | .060 | 175.0          | -.010              | 1.032 | -.024               | -.016 | -.024               | -.016 | -.015 |
| 90.0           | -.123              | -.080 | .124                | .059 | 180.0          | -.004              | 1.022 | -.020               | -.022 | -.020               | -.022 | -.015 |

Table A-3 cont'd

| ***AZIMUTH ANGLE = 140.0**** |                 |                             |      |                              |       |      |                |                 |                             |      |                              |       |       |
|------------------------------|-----------------|-----------------------------|------|------------------------------|-------|------|----------------|-----------------|-----------------------------|------|------------------------------|-------|-------|
| ELEV.<br>ANGLE               | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW   |
| 0                            | .006            | -.590                       | .192 | -.015                        | .000  | .085 | 90.0           | -.140           | -.060                       | .118 | -.05                         | -.004 | .053  |
| 5.0                          | -.016           | -.584                       | .191 | -.019                        | .005  | .086 | 95.0           | -.152           | .041                        | .127 | -.057                        | -.003 | .053  |
| 10.0                         | -.036           | -.575                       | .190 | -.024                        | .009  | .086 | 100.0          | -.158           | .175                        | .137 | -.058                        | -.003 | .052  |
| 15.0                         | -.054           | -.565                       | .189 | -.029                        | .012  | .086 | 105.0          | -.158           | .301                        | .142 | -.062                        | -.002 | .053  |
| 20.0                         | -.072           | -.547                       | .187 | -.035                        | .011  | .085 | 110.0          | -.153           | .433                        | .144 | -.068                        | -.002 | .051  |
| 25.0                         | -.085           | -.521                       | .184 | -.043                        | .008  | .084 | 115.0          | -.147           | .568                        | .143 | -.075                        | -.001 | .048  |
| 30.0                         | -.098           | -.490                       | .181 | -.052                        | .008  | .082 | 120.0          | -.138           | .685                        | .139 | -.073                        | -.002 | .043  |
| 35.0                         | -.109           | -.526                       | .176 | -.062                        | .004  | .080 | 125.0          | -.127           | .782                        | .132 | -.061                        | -.003 | .033  |
| 40.0                         | -.118           | -.427                       | .170 | -.069                        | .003  | .079 | 130.0          | -.112           | .860                        | .122 | -.039                        | -.005 | .019  |
| 45.0                         | -.126           | -.400                       | .164 | -.072                        | .001  | .077 | 135.0          | -.096           | .920                        | .110 | -.027                        | -.007 | .007  |
| 50.0                         | -.134           | -.377                       | .156 | -.071                        | .001  | .076 | 140.0          | -.076           | .956                        | .098 | -.029                        | -.009 | -.002 |
| 55.0                         | -.138           | -.356                       | .145 | -.070                        | .000  | .073 | 145.0          | -.058           | .977                        | .088 | -.033                        | -.011 | -.008 |
| 60.0                         | -.142           | -.335                       | .137 | -.068                        | -.001 | .070 | 150.0          | -.041           | 1.004                       | .078 | -.038                        | -.013 | -.012 |
| 65.0                         | -.142           | -.316                       | .127 | -.066                        | -.001 | .067 | 155.0          | -.031           | 1.010                       | .068 | -.039                        | -.009 | -.015 |
| 70.0                         | -.139           | -.285                       | .120 | -.064                        | -.003 | .063 | 160.0          | -.023           | 1.041                       | .060 | -.038                        | -.005 | -.014 |
| 75.0                         | -.138           | -.248                       | .116 | -.063                        | -.003 | .060 | 165.0          | -.017           | 1.051                       | .054 | -.037                        | -.003 | -.014 |
| 80.0                         | -.137           | -.193                       | .113 | -.061                        | -.003 | .056 | 170.0          | -.013           | 1.062                       | .049 | -.032                        | -.004 | -.014 |
| 85.0                         | -.136           | -.139                       | .113 | -.059                        | -.003 | .054 | 175.0          | -.009           | 1.063                       | .042 | -.024                        | -.008 | -.014 |
| 90.0                         | -.140           | -.060                       | .118 | -.057                        | -.004 | .053 | 180.0          | -.004           | 1.058                       | .039 | -.017                        | -.011 | -.016 |

| ***AZIMUTH ANGLE = 145.0**** |                 |                             |      |                              |       |      |                |                 |                             |      |                              |       |       |
|------------------------------|-----------------|-----------------------------|------|------------------------------|-------|------|----------------|-----------------|-----------------------------|------|------------------------------|-------|-------|
| ELEV.<br>ANGLE               | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW   |
| 0                            | .005            | -.650                       | .189 | -.012                        | .001  | .090 | 90.0           | -.157           | -.040                       | .113 | -.065                        | -.003 | .048  |
| 5.0                          | -.023           | -.648                       | .188 | -.015                        | .003  | .092 | 95.0           | -.166           | .061                        | .120 | -.064                        | -.002 | .047  |
| 10.0                         | -.048           | -.637                       | .187 | -.018                        | .007  | .092 | 100.0          | -.170           | .187                        | .126 | -.065                        | -.002 | .046  |
| 15.0                         | -.070           | -.618                       | .186 | -.021                        | .012  | .092 | 105.0          | -.169           | .320                        | .129 | -.067                        | -.002 | .046  |
| 20.0                         | -.090           | -.594                       | .183 | -.026                        | .010  | .090 | 110.0          | -.162           | .466                        | .128 | -.071                        | -.002 | .043  |
| 25.0                         | -.105           | -.560                       | .180 | -.036                        | .005  | .089 | 115.0          | -.153           | .605                        | .125 | -.076                        | -.001 | .040  |
| 30.0                         | -.119           | -.521                       | .176 | -.048                        | .004  | .086 | 120.0          | -.142           | .728                        | .119 | -.076                        | -.001 | .034  |
| 35.0                         | -.129           | -.520                       | .170 | -.065                        | .002  | .084 | 125.0          | -.129           | .824                        | .111 | -.068                        | -.002 | .024  |
| 40.0                         | -.138           | -.444                       | .163 | -.075                        | .001  | .082 | 130.0          | -.112           | .900                        | .101 | -.053                        | -.004 | .009  |
| 45.0                         | -.145           | -.400                       | .156 | -.079                        | .001  | .080 | 135.0          | -.093           | .956                        | .090 | -.044                        | -.006 | .000  |
| 50.0                         | -.153           | -.364                       | .147 | -.078                        | .001  | .079 | 140.0          | -.071           | .983                        | .079 | -.042                        | -.008 | -.008 |
| 55.0                         | -.155           | -.340                       | .135 | -.076                        | .001  | .075 | 145.0          | -.053           | 1.004                       | .070 | -.042                        | -.010 | -.013 |
| 60.0                         | -.159           | -.317                       | .126 | -.074                        | .001  | .072 | 150.0          | -.038           | 1.027                       | .061 | -.043                        | -.014 | -.016 |
| 65.0                         | -.157           | -.299                       | .115 | -.072                        | .000  | .067 | 155.0          | -.029           | 1.020                       | .052 | -.044                        | -.008 | -.017 |
| 70.0                         | -.152           | -.279                       | .110 | -.072                        | -.001 | .062 | 160.0          | -.021           | 1.062                       | .046 | -.044                        | -.003 | -.015 |
| 75.0                         | -.151           | -.245                       | .107 | -.072                        | -.001 | .057 | 165.0          | -.016           | 1.071                       | .042 | -.043                        | -.001 | -.014 |
| 80.0                         | -.151           | -.187                       | .106 | -.070                        | -.001 | .052 | 170.0          | -.012           | 1.081                       | .041 | -.036                        | .001  | -.014 |
| 85.0                         | -.153           | -.126                       | .108 | -.067                        | -.002 | .049 | 175.0          | -.008           | 1.094                       | .034 | -.025                        | .001  | -.014 |
| 90.0                         | -.157           | -.040                       | .113 | -.065                        | -.003 | .048 | 180.0          | -.004           | 1.094                       | .032 | -.014                        | .000  | -.017 |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 150.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0              | .004               | -.710 | .187                | .096 | 90.0           | -.175              | -.020 | .108                | -.073 | -.002               | .043  |
| 5.0            | -.030              | -.712 | .186                | .098 | 95.0           | -.181              | .082  | .113                | -.072 | -.002               | .042  |
| 10.0           | -.060              | -.700 | .185                | .098 | 100.0          | -.183              | .200  | .116                | -.072 | -.002               | .040  |
| 15.0           | -.086              | -.671 | .183                | .098 | 105.0          | -.180              | .340  | .116                | -.072 | -.002               | .039  |
| 20.0           | -.108              | -.641 | .180                | .096 | 110.0          | -.171              | .500  | .112                | -.075 | -.002               | .036  |
| 25.0           | -.125              | -.600 | .176                | .095 | 115.0          | -.160              | .642  | .107                | -.078 | -.001               | .032  |
| 30.0           | -.140              | -.552 | .171                | .091 | 120.0          | -.146              | .771  | .099                | -.079 | -.001               | .025  |
| 35.0           | -.150              | -.514 | .164                | .088 | 125.0          | -.131              | .865  | .090                | -.075 | -.002               | .015  |
| 40.0           | -.158              | -.461 | .156                | .085 | 130.0          | -.113              | .941  | .080                | -.068 | -.004               | .000  |
| 45.0           | -.165              | -.400 | .148                | .083 | 135.0          | -.091              | .993  | .070                | -.061 | -.006               | -.009 |
| 50.0           | -.172              | -.352 | .139                | .082 | 140.0          | -.067              | 1.010 | .060                | -.055 | -.008               | -.014 |
| 55.0           | -.173              | -.324 | .125                | .078 | 145.0          | -.048              | 1.032 | .052                | -.051 | -.010               | -.018 |
| 60.0           | -.176              | -.300 | .116                | .074 | 150.0          | -.035              | 1.050 | .045                | -.049 | -.015               | -.020 |
| 65.0           | -.172              | -.282 | .104                | .067 | 155.0          | -.027              | 1.031 | .037                | -.049 | -.007               | -.020 |
| 70.0           | -.165              | -.273 | .100                | .061 | 160.0          | -.020              | 1.083 | .033                | -.050 | -.001               | -.016 |
| 75.0           | -.164              | -.243 | .098                | .054 | 165.0          | -.016              | 1.092 | .030                | -.049 | .000                | -.014 |
| 80.0           | -.165              | -.181 | .099                | .048 | 170.0          | -.011              | 1.100 | .033                | -.040 | -.002               | -.014 |
| 85.0           | -.170              | -.113 | .103                | .044 | 175.0          | -.008              | 1.125 | .026                | -.026 | -.006               | -.014 |
| 90.0           | -.175              | -.020 | .108                | .043 | 180.0          | -.004              | 1.131 | .025                | -.012 | -.010               | -.018 |

\*\*\*AZIMUTH ANGLE = 155.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | PITCH | ROLL                | YAW   |
| 0              | .008               | -.757 | .147                | .072 | 90.0           | -.186              | -.016 | .092                | -.081 | -.002               | .034  |
| 5.0            | -.015              | -.759 | .145                | .074 | 95.0           | -.192              | .095  | .095                | -.080 | -.001               | .033  |
| 10.0           | -.038              | -.751 | .145                | .074 | 100.0          | -.192              | .223  | .096                | -.080 | -.002               | .031  |
| 15.0           | -.060              | -.728 | .143                | .074 | 105.0          | -.189              | .374  | .096                | -.079 | -.001               | .030  |
| 20.0           | -.082              | -.700 | .140                | .073 | 110.0          | -.177              | .530  | .092                | -.080 | .000                | .029  |
| 25.0           | -.103              | -.666 | .138                | .072 | 115.0          | -.161              | .669  | .086                | -.079 | .002                | .029  |
| 30.0           | -.122              | -.622 | .134                | .069 | 120.0          | -.144              | .794  | .079                | -.076 | .002                | .024  |
| 35.0           | -.138              | -.583 | .130                | .067 | 125.0          | -.127              | .845  | .072                | -.068 | .001                | .015  |
| 40.0           | -.152              | -.527 | .124                | .065 | 130.0          | -.108              | .955  | .064                | -.060 | -.002               | .010  |
| 45.0           | -.162              | -.464 | .119                | .064 | 135.0          | -.086              | 1.002 | .057                | -.053 | -.006               | -.010 |
| 50.0           | -.171              | -.412 | .113                | .063 | 140.0          | -.064              | 1.020 | .049                | -.048 | -.007               | -.013 |
| 55.0           | -.177              | -.370 | .103                | .060 | 145.0          | -.046              | 1.042 | .041                | -.047 | -.006               | -.014 |
| 60.0           | -.179              | -.337 | .097                | .057 | 150.0          | -.034              | 1.056 | .035                | -.048 | -.007               | -.014 |
| 65.0           | -.175              | -.308 | .090                | .052 | 155.0          | -.024              | 1.054 | .026                | -.048 | .000                | -.014 |
| 70.0           | -.170              | -.285 | .087                | .048 | 160.0          | -.015              | 1.099 | .021                | -.049 | .005                | -.011 |
| 75.0           | -.171              | -.249 | .086                | .042 | 165.0          | -.011              | 1.108 | .017                | -.048 | .006                | -.010 |
| 80.0           | -.175              | -.184 | .087                | .038 | 170.0          | -.008              | 1.117 | .018                | -.042 | .003                | -.011 |
| 85.0           | -.182              | -.112 | .089                | .035 | 175.0          | -.006              | 1.141 | .014                | -.033 | -.003               | -.011 |
| 90.0           | -.186              | -.016 | .092                | .034 | 180.0          | -.004              | 1.145 | .013                | -.025 | -.011               | -.015 |

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Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 160.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |      |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |       |
|----------------|--------------------|-------|------|---------------------|------|------|----------------|--------------------|-------|------|---------------------|-------|-------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW   |
| 0              | .013               | -.804 | .107 | .002                | .003 | .048 | 90.0           | -.197              | -.013 | .076 | -.089               | -.003 | .025  |
| 5.0            | .000               | -.806 | .104 | -.007               | .003 | .050 | 95.0           | -.203              | .108  | .077 | -.089               | .000  | .024  |
| 10.0           | -.017              | -.802 | .106 | -.016               | .004 | .050 | 100.0          | -.202              | .247  | .077 | -.088               | -.003 | .022  |
| 15.0           | -.034              | -.785 | .103 | -.025               | .007 | .050 | 105.0          | -.198              | .408  | .076 | -.086               | -.001 | .021  |
| 20.0           | -.056              | -.760 | .101 | -.036               | .006 | .050 | 110.0          | -.183              | .561  | .072 | -.085               | .002  | .022  |
| 25.0           | -.081              | -.733 | .100 | -.049               | .003 | .049 | 115.0          | -.163              | .696  | .066 | -.081               | .005  | .026  |
| 30.0           | -.105              | -.692 | .097 | -.061               | .002 | .048 | 120.0          | -.143              | .817  | .060 | -.074               | .006  | .024  |
| 35.0           | -.126              | -.652 | .096 | -.074               | .002 | .047 | 125.0          | -.123              | .905  | .054 | -.062               | .004  | .015  |
| 40.0           | -.146              | -.593 | .092 | -.084               | .002 | .045 | 130.0          | -.103              | .969  | .048 | -.052               | .001  | -.003 |
| 45.0           | -.159              | -.528 | .090 | -.088               | .001 | .045 | 135.0          | -.081              | 1.011 | .044 | -.051               | .007  | -.012 |
| 50.0           | -.171              | -.473 | .087 | -.091               | .001 | .044 | 140.0          | -.061              | 1.031 | .038 | -.042               | .006  | -.012 |
| 55.0           | -.181              | -.416 | .082 | -.091               | .001 | .042 | 145.0          | -.045              | 1.052 | .031 | -.043               | .002  | -.010 |
| 60.0           | -.182              | -.374 | .079 | -.091               | .000 | .040 | 150.0          | -.033              | 1.063 | .025 | -.047               | .000  | -.008 |
| 65.0           | -.178              | -.334 | .076 | -.090               | .000 | .037 | 155.0          | -.022              | 1.077 | .015 | -.048               | .007  | -.008 |
| 70.0           | -.175              | -.297 | .074 | -.091               | .001 | .035 | 160.0          | -.010              | 1.115 | .009 | -.048               | .011  | -.007 |
| 75.0           | -.178              | -.255 | .074 | -.091               | .002 | .031 | 165.0          | -.006              | 1.124 | .004 | -.048               | .012  | .006  |
| 80.0           | -.185              | -.188 | .075 | -.091               | .002 | .028 | 170.0          | -.006              | 1.134 | .003 | -.045               | .008  | -.008 |
| 85.0           | -.194              | -.111 | .075 | -.090               | .003 | .026 | 175.0          | -.005              | 1.157 | .002 | -.041               | .000  | -.009 |
| 90.0           | -.197              | -.013 | .076 | -.089               | .003 | .025 | 180.0          | -.004              | 1.159 | .001 | -.038               | -.013 | -.013 |

\*\*\*AZIMUTH ANGLE = 165.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |       |      |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|-------|-------|------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | ROLL               | YAW   | NORMAL              | AXIAL | SIDE  | PITCH | ROLL |
| 0              | .018               | -.852 | .068                | .008  | .004           | .024               | -.209 | -.010               | .061  | -.098 | -.004 | .016 |
| 5.0            | .015               | -.853 | .063                | -.006 | .004           | .026               | -.215 | .122                | .060  | -.098 | .000  | .015 |
| 10.0           | .004               | -.853 | .067                | -.019 | .004           | .026               | -.212 | .271                | .058  | -.097 | -.004 | .013 |
| 15.0           | -.009              | -.843 | .063                | -.032 | .005           | .027               | -.207 | .443                | .056  | -.094 | -.001 | .013 |
| 20.0           | -.030              | -.820 | .062                | -.046 | .005           | .027               | -.190 | .592                | .052  | -.090 | .004  | .016 |
| 25.0           | -.060              | -.800 | .062                | -.059 | .004           | .027               | -.165 | .723                | .046  | -.083 | .008  | .023 |
| 30.0           | -.088              | -.763 | .061                | -.070 | .004           | .027               | -.142 | .840                | .041  | -.072 | .010  | .024 |
| 35.0           | -.115              | -.722 | .062                | -.078 | .004           | .027               | -.120 | .924                | .037  | -.056 | .007  | .015 |
| 40.0           | -.140              | -.680 | .061                | -.085 | .004           | .026               | -.099 | .983                | .033  | -.044 | .000  | .005 |
| 45.0           | -.156              | -.593 | .061                | -.090 | .002           | .026               | -.076 | 1.021               | .031  | -.037 | .008  | .014 |
| 50.0           | -.171              | -.534 | .061                | -.094 | .001           | .025               | -.059 | 1.042               | .027  | -.036 | -.006 | .011 |
| 55.0           | -.186              | -.463 | .061                | -.096 | .000           | .025               | -.044 | 1.063               | .021  | -.040 | .001  | .006 |
| 60.0           | -.186              | -.412 | .061                | -.097 | .001           | .024               | -.032 | 1.070               | .015  | -.046 | .008  | .003 |
| 65.0           | -.182              | -.360 | .062                | -.097 | .002           | .023               | -.020 | 1.100               | .005  | -.048 | .014  | .003 |
| 70.0           | -.181              | -.310 | .062                | -.097 | .003           | .022               | -.006 | 1.131               | .002  | -.048 | .017  | .003 |
| 75.0           | -.186              | -.262 | .062                | -.097 | .004           | .020               | -.002 | 1.141               | .008  | -.048 | .019  | .003 |
| 80.0           | -.196              | -.192 | .064                | -.097 | .004           | .019               | -.004 | 1.152               | .011  | -.048 | .014  | .005 |
| 85.0           | -.206              | -.111 | .062                | -.098 | .005           | .018               | -.004 | 1.173               | .010  | -.049 | .002  | .007 |
| 90.0           | -.209              | -.010 | .061                | -.098 | .004           | .016               | -.004 | 1.173               | .010  | -.051 | -.015 | .011 |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 170.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  | YAW   |
| .0             | .015               | -.865 | .046                | .016 | 90.0           | -.189              | -.023 | -.089               | -.002 | -.089               | -.002 | .010  |
| 5.0            | .000               | -.862 | .042                | .018 | 95.0           | -.192              | .114  | -.087               | .000  | -.087               | .000  | .010  |
| 10.0           | -.018              | -.859 | .044                | .018 | 100.0          | -.190              | .274  | -.086               | -.002 | -.086               | -.002 | .009  |
| 15.0           | -.039              | -.846 | .041                | .019 | 105.0          | -.187              | .442  | -.082               | .000  | -.082               | .000  | .009  |
| 20.0           | -.061              | -.823 | .040                | .019 | 110.0          | -.176              | .588  | -.078               | .003  | -.078               | .003  | .011  |
| 25.0           | -.092              | -.800 | .041                | .018 | 115.0          | -.163              | .725  | -.071               | .006  | -.071               | .006  | .016  |
| 30.0           | -.117              | -.762 | .041                | .018 | 120.0          | -.142              | .847  | -.061               | .007  | -.061               | .007  | .017  |
| 35.0           | -.140              | -.721 | .041                | .017 | 125.0          | -.124              | .930  | -.048               | .005  | -.048               | .005  | .011  |
| 40.0           | -.161              | -.661 | .041                | .017 | 130.0          | -.102              | .987  | -.037               | .001  | -.037               | .001  | -.002 |
| 45.0           | -.174              | -.593 | .041                | .017 | 135.0          | -.077              | 1.024 | -.031               | -.004 | -.031               | -.004 | -.008 |
| 50.0           | -.185              | -.527 | .040                | .017 | 140.0          | -.059              | 1.049 | -.030               | -.002 | -.030               | -.002 | -.006 |
| 55.0           | -.195              | -.446 | .040                | .018 | 145.0          | -.044              | 1.069 | -.033               | .001  | -.033               | .001  | -.003 |
| 60.0           | -.193              | -.388 | .040                | .017 | 150.0          | -.031              | 1.077 | -.037               | .006  | -.037               | .006  | -.002 |
| 65.0           | -.188              | -.337 | .041                | .016 | 155.0          | -.020              | 1.104 | -.038               | .009  | -.038               | .009  | -.002 |
| 70.0           | -.183              | -.287 | .042                | .013 | 160.0          | -.006              | 1.131 | -.038               | .011  | -.038               | .011  | -.002 |
| 75.0           | -.182              | -.241 | .042                | .011 | 165.0          | -.001              | 1.141 | -.039               | .012  | -.039               | .012  | -.002 |
| 80.0           | -.185              | -.184 | .042                | .011 | 170.0          | .001               | 1.151 | -.040               | .008  | -.040               | .008  | -.004 |
| 85.0           | -.189              | -.114 | .040                | .011 | 175.0          | -.001              | 1.169 | -.042               | .002  | -.042               | .002  | -.005 |
| 90.0           | -.189              | -.023 | .039                | .010 | 180.0          | -.001              | 1.172 | -.045               | -.010 | -.045               | -.010 | -.008 |

\*\*\*AZIMUTH ANGLE = 175.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|-------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  | YAW   |
| .0             | .012               | -.879 | .025                | .009 | 90.0           | -.169              | -.036 | -.080               | -.001 | -.080               | -.001 | .005  |
| 5.0            | -.016              | -.871 | .022                | .010 | 95.0           | -.170              | .107  | -.077               | .000  | -.077               | .000  | .005  |
| 10.0           | -.041              | -.865 | .021                | .010 | 100.0          | -.169              | .278  | -.075               | .000  | -.075               | .000  | .005  |
| 15.0           | -.069              | -.849 | .019                | .011 | 105.0          | -.167              | .441  | -.071               | .001  | -.071               | .001  | .005  |
| 20.0           | -.093              | -.827 | .019                | .011 | 110.0          | -.162              | .584  | -.066               | .002  | -.066               | .002  | .006  |
| 25.0           | -.125              | -.800 | .020                | .010 | 115.0          | -.161              | .728  | -.059               | .004  | -.059               | .004  | .009  |
| 30.0           | -.146              | -.761 | .021                | .010 | 120.0          | -.143              | .854  | -.051               | .005  | -.051               | .005  | .010  |
| 35.0           | -.165              | -.720 | .021                | .009 | 125.0          | -.128              | .935  | -.041               | .004  | -.041               | .004  | .007  |
| 40.0           | -.182              | -.662 | .021                | .009 | 130.0          | -.105              | .991  | -.031               | .002  | -.031               | .002  | .000  |
| 45.0           | -.192              | -.593 | .021                | .009 | 135.0          | -.078              | 1.028 | -.025               | .000  | -.025               | .000  | -.002 |
| 50.0           | -.199              | -.520 | .020                | .010 | 140.0          | -.059              | 1.056 | -.025               | .000  | -.025               | .000  | -.002 |
| 55.0           | -.204              | -.429 | .019                | .011 | 145.0          | -.044              | 1.075 | -.026               | .002  | -.026               | .002  | -.001 |
| 60.0           | -.201              | -.364 | .019                | .011 | 150.0          | -.031              | 1.084 | -.028               | .004  | -.028               | .004  | -.001 |
| 65.0           | -.194              | -.315 | .020                | .009 | 155.0          | -.020              | 1.108 | -.029               | .005  | -.029               | .005  | -.001 |
| 70.0           | -.185              | -.264 | .022                | .004 | 160.0          | -.006              | 1.131 | -.029               | .005  | -.029               | .005  | -.002 |
| 75.0           | -.178              | -.220 | .022                | .002 | 165.0          | .000               | 1.142 | -.030               | -.007 | -.030               | -.007 | -.002 |
| 80.0           | -.174              | -.177 | .021                | .003 | 170.0          | .002               | 1.151 | -.032               | .003  | -.032               | .003  | -.003 |
| 85.0           | -.172              | -.117 | .018                | .004 | 175.0          | .002               | 1.165 | -.035               | .002  | -.035               | .002  | -.003 |
| 90.0           | -.169              | -.036 | .017                | .005 | 180.0          | .001               | 1.171 | -.039               | -.005 | -.039               | -.005 | -.005 |

Table A-3 cont'd

\*\*\*AZIMUTH ANGLE = 180.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | FORCE COEFFICIENTS<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW |
|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------|------------------------------|-----------------------------|----------------------------|------------------------------|-----------------------------|----------------------------|
| 0              | .010                         | -.893                       | .004                       | .030                         | .001                        | .002                       | 90.0           | -.150                        | -.050                       | -.004                      | -.071                        | .000                        | .000                       |
| 5.0            | -.032                        | -.881                       | .002                       | .029                         | .002                        | .002                       | 95.0           | -.148                        | .100                        | -.004                      | -.067                        | .000                        | .001                       |
| 10.0           | -.064                        | -.871                       | .001                       | .026                         | .003                        | .003                       | 100.0          | -.148                        | .282                        | -.003                      | -.064                        | .001                        | .001                       |
| 15.0           | -.100                        | -.852                       | .002                       | .020                         | .002                        | .004                       | 105.0          | -.148                        | .441                        | -.002                      | -.060                        | .002                        | .002                       |
| 20.0           | -.125                        | -.831                       | .002                       | .008                         | .000                        | .004                       | 110.0          | -.149                        | .581                        | -.001                      | -.055                        | .002                        | .002                       |
| 25.0           | -.158                        | -.800                       | .000                       | .013                         | -.002                       | .002                       | 115.0          | -.159                        | .731                        | .000                       | -.048                        | .002                        | .002                       |
| 30.0           | -.176                        | -.761                       | .001                       | .037                         | .003                        | .002                       | 120.0          | -.144                        | .862                        | .001                       | -.041                        | .003                        | .003                       |
| 35.0           | -.191                        | -.720                       | .001                       | .075                         | -.002                       | .001                       | 125.0          | -.132                        | .941                        | .001                       | -.034                        | .003                        | .003                       |
| 40.0           | -.204                        | -.663                       | .001                       | .101                         | -.001                       | .001                       | 130.0          | -.109                        | .995                        | .002                       | -.025                        | .004                        | .003                       |
| 45.0           | -.210                        | -.594                       | .001                       | .110                         | .000                        | .001                       | 135.0          | -.080                        | 1.032                       | .002                       | -.020                        | .004                        | .003                       |
| 50.0           | -.213                        | -.513                       | .000                       | .110                         | .001                        | .003                       | 140.0          | -.060                        | 1.063                       | .001                       | -.020                        | .004                        | .002                       |
| 55.0           | -.213                        | -.412                       | .001                       | .109                         | .001                        | .004                       | 145.0          | -.045                        | 1.081                       | -.002                      | -.020                        | .003                        | .001                       |
| 60.0           | -.209                        | -.341                       | .002                       | .108                         | .001                        | .005                       | 150.0          | -.031                        | 1.091                       | -.003                      | -.020                        | .003                        | .000                       |
| 65.0           | -.200                        | -.293                       | .000                       | .105                         | .000                        | .003                       | 155.0          | -.020                        | 1.112                       | -.004                      | -.020                        | .001                        | -.001                      |
| 70.0           | -.188                        | -.241                       | .002                       | .102                         | -.001                       | .004                       | 160.0          | -.007                        | 1.132                       | -.005                      | -.020                        | -.001                       | -.002                      |
| 75.0           | -.175                        | -.200                       | .002                       | .097                         | -.001                       | .006                       | 165.0          | .001                         | 1.143                       | -.005                      | -.022                        | .002                        | -.002                      |
| 80.0           | -.163                        | -.170                       | .000                       | .088                         | -.001                       | .004                       | 170.0          | .005                         | 1.151                       | -.005                      | -.024                        | -.002                       | -.002                      |
| 85.0           | -.155                        | -.120                       | .003                       | .078                         | -.001                       | .002                       | 175.0          | .005                         | 1.161                       | -.005                      | -.029                        | .002                        | -.002                      |
| 90.0           | -.150                        | -.050                       | .004                       | .071                         | .000                        | .000                       | 180.0          | .004                         | 1.171                       | -.005                      | -.033                        | -.001                       | -.002                      |



Table A-4. Wind load coefficients for paraboloid,  $F/D = 0.313$ ,  $H/D = 0.200$ , porosity 50%

| *****AZIMUTH ANGLE = 0****   |                    |       |                     |       |                |                    |       |                     |       |                |
|------------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|----------------|
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |
|                              | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL  |                |
| 0                            | .007               | .852  | .024                | -.003 | 90.0           | .208               | -.002 | .080                | .000  | 90.0           |
| 5.0                          | .021               | .850  | .028                | -.003 | 95.0           | .202               | -.078 | .079                | -.001 | 95.0           |
| 10.0                         | .039               | .852  | .032                | -.002 | 100.0          | .197               | -.135 | .079                | -.001 | 100.0          |
| 15.0                         | .059               | .840  | .034                | -.002 | 105.0          | .197               | -.172 | .080                | -.001 | 105.0          |
| 20.0                         | .080               | .830  | .037                | -.001 | 110.0          | .203               | -.215 | .084                | -.000 | 110.0          |
| 25.0                         | .105               | .812  | .038                | -.000 | 115.0          | .217               | -.252 | .088                | .001  | 115.0          |
| 30.0                         | .131               | .785  | .038                | -.001 | 120.0          | .224               | -.292 | .092                | .002  | 120.0          |
| 35.0                         | .153               | .730  | .035                | -.002 | 125.0          | .232               | -.340 | .095                | .002  | 125.0          |
| 40.0                         | .175               | .686  | .032                | -.003 | 130.0          | .224               | -.385 | .095                | .000  | 130.0          |
| 45.0                         | .198               | .631  | .032                | -.003 | 135.0          | .236               | -.440 | .091                | -.002 | 135.0          |
| 50.0                         | .222               | .590  | .040                | -.003 | 140.0          | .230               | -.510 | .083                | -.002 | 140.0          |
| 55.0                         | .250               | .560  | .054                | -.002 | 145.0          | .219               | -.579 | .072                | -.001 | 145.0          |
| 60.0                         | .257               | .520  | .067                | -.001 | 150.0          | .202               | -.648 | .044                | .001  | 150.0          |
| 65.0                         | .260               | .471  | .076                | -.001 | 155.0          | .183               | -.692 | .013                | .002  | 155.0          |
| 70.0                         | .258               | .371  | .079                | -.001 | 160.0          | .158               | -.732 | -.010               | .003  | 160.0          |
| 75.0                         | .239               | .200  | .081                | -.001 | 165.0          | .128               | -.756 | -.026               | .004  | 165.0          |
| 80.0                         | .229               | .125  | .082                | -.000 | 170.0          | .094               | -.777 | -.036               | .004  | 170.0          |
| 85.0                         | .220               | .050  | .081                | -.000 | 175.0          | .054               | -.786 | -.046               | .002  | 175.0          |
| 90.0                         | .208               | -.002 | .080                | -.000 | 180.0          | .006               | -.789 | -.052               | .001  | 180.0          |
| *****AZIMUTH ANGLE = 5.0**** |                    |       |                     |       |                |                    |       |                     |       |                |
| ELEV.<br>ANGLE               | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |
|                              | NORMAL             | AXIAL | PITCH               | ROLL  |                | NORMAL             | AXIAL | PITCH               | ROLL  |                |
| 0                            | .011               | .841  | .035                | .003  | 90.0           | .218               | -.001 | .083                | -.001 | 90.0           |
| 5.0                          | .026               | .840  | .035                | .002  | 95.0           | .216               | -.073 | .082                | -.002 | 95.0           |
| 10.0                         | .043               | .838  | .037                | .001  | 100.0          | .213               | -.130 | .078                | -.001 | 100.0          |
| 15.0                         | .062               | .834  | .037                | -.002 | 105.0          | .213               | -.169 | .082                | -.001 | 105.0          |
| 20.0                         | .083               | .824  | .038                | -.001 | 110.0          | .216               | -.211 | .084                | .000  | 110.0          |
| 25.0                         | .108               | .808  | .038                | -.003 | 115.0          | .222               | -.250 | .086                | .002  | 115.0          |
| 30.0                         | .133               | .783  | .038                | -.003 | 120.0          | .222               | -.286 | .088                | .002  | 120.0          |
| 35.0                         | .156               | .738  | .037                | -.002 | 125.0          | .223               | -.333 | .089                | .002  | 125.0          |
| 40.0                         | .179               | .697  | .036                | -.000 | 130.0          | .214               | -.382 | .087                | .001  | 130.0          |
| 45.0                         | .202               | .644  | .038                | .002  | 135.0          | .216               | -.439 | .083                | .000  | 135.0          |
| 50.0                         | .224               | .601  | .046                | .004  | 140.0          | .206               | -.503 | .075                | .000  | 140.0          |
| 55.0                         | .247               | .560  | .058                | .004  | 145.0          | .193               | -.569 | .065                | .000  | 145.0          |
| 60.0                         | .264               | .518  | .069                | .004  | 150.0          | .174               | -.633 | .044                | .001  | 150.0          |
| 65.0                         | .256               | .461  | .076                | .004  | 155.0          | .154               | -.676 | .021                | .002  | 155.0          |
| 70.0                         | .253               | .368  | .080                | .003  | 160.0          | .130               | -.714 | .003                | .002  | 160.0          |
| 75.0                         | .238               | .225  | .082                | .002  | 165.0          | .101               | -.740 | -.010               | .003  | 165.0          |
| 80.0                         | .230               | .140  | .084                | .000  | 170.0          | .070               | -.761 | -.020               | .003  | 170.0          |
| 85.0                         | .224               | .065  | .083                | .000  | 175.0          | .052               | -.770 | -.030               | .001  | 175.0          |
| 90.0                         | .218               | -.001 | .083                | -.001 | 180.0          | .001               | -.772 | -.037               | .001  | 180.0          |

Table A-4 cont'd

| ***AZIMUTH ANGLE = 10.0*** |                    |       |                     |       |                |  |                    |       |                     |       |       |      |
|----------------------------|--------------------|-------|---------------------|-------|----------------|--|--------------------|-------|---------------------|-------|-------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |  | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW   |      |
|                            | NORMAL             | AXIAL | PITCH               | ROLL  |                |  | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH | ROLL |
| 0                          | .015               | .831  | .046                | .010  | 90.0           |  | .229               | .000  | .086                | -.002 | .025  |      |
| 5.0                        | .031               | .830  | .043                | .008  | 95.0           |  | .230               | -.069 | .085                | -.003 | .025  |      |
| 10.0                       | .047               | .824  | .042                | .005  | 100.0          |  | .230               | -.125 | .078                | -.002 | .025  |      |
| 15.0                       | .066               | .828  | .040                | -.002 | 105.0          |  | .230               | -.167 | .084                | -.001 | .024  |      |
| 20.0                       | .086               | .818  | .039                | -.004 | 110.0          |  | .229               | -.208 | .085                | .001  | .024  |      |
| 25.0                       | .112               | .804  | .039                | -.006 | 115.0          |  | .227               | -.248 | .085                | .003  | .026  |      |
| 30.0                       | .135               | .781  | .039                | -.007 | 120.0          |  | .221               | -.281 | .084                | .003  | .027  |      |
| 35.0                       | .159               | .746  | .039                | -.006 | 125.0          |  | .214               | -.326 | .083                | .003  | .025  |      |
| 40.0                       | .183               | .708  | .041                | -.002 | 130.0          |  | .204               | -.379 | .079                | .002  | .025  |      |
| 45.0                       | .206               | .658  | .044                | .002  | 135.0          |  | .196               | -.438 | .075                | .002  | .024  |      |
| 50.0                       | .227               | .613  | .052                | .005  | 140.0          |  | .183               | -.496 | .067                | .002  | .024  |      |
| 55.0                       | .244               | .560  | .062                | .007  | 145.0          |  | .167               | -.560 | .059                | .001  | .024  |      |
| 60.0                       | .252               | .516  | .071                | .007  | 150.0          |  | .147               | -.619 | .044                | .001  | .026  |      |
| 65.0                       | .252               | .451  | .077                | .007  | 155.0          |  | .125               | -.660 | .029                | .002  | .026  |      |
| 70.0                       | .249               | .365  | .081                | .005  | 160.0          |  | .102               | -.696 | .016                | .001  | .026  |      |
| 75.0                       | .237               | .250  | .084                | .003  | 165.0          |  | .075               | -.724 | .005                | .002  | .026  |      |
| 80.0                       | .231               | .155  | .086                | .000  | 170.0          |  | .047               | -.745 | -.004               | .002  | .026  |      |
| 85.0                       | .228               | .080  | .086                | -.001 | 175.0          |  | .051               | -.755 | -.014               | .001  | .025  |      |
| 90.0                       | .229               | .000  | .086                | -.002 | 180.0          |  | -.003              | -.756 | -.022               | .001  | .024  |      |
| ***AZIMUTH ANGLE = 15.0*** |                    |       |                     |       |                |  |                    |       |                     |       |       |      |
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |  | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | YAW   |      |
|                            | NORMAL             | AXIAL | PITCH               | ROLL  |                |  | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH | ROLL |
| 0                          | .019               | .821  | .057                | .017  | 90.0           |  | .240               | .000  | .089                | -.004 | .039  |      |
| 5.0                        | .036               | .821  | .051                | .014  | 95.0           |  | .244               | -.065 | .088                | -.004 | .039  |      |
| 10.0                       | .052               | .811  | .047                | .010  | 100.0          |  | .247               | -.120 | .078                | -.003 | .039  |      |
| 15.0                       | .070               | .823  | .044                | -.002 | 105.0          |  | .247               | -.165 | .087                | -.001 | .038  |      |
| 20.0                       | .090               | .812  | .041                | -.007 | 110.0          |  | .242               | -.205 | .086                | .002  | .038  |      |
| 25.0                       | .116               | .800  | .040                | -.010 | 115.0          |  | .232               | -.246 | .084                | .004  | .037  |      |
| 30.0                       | .138               | .780  | .040                | -.012 | 120.0          |  | .220               | -.276 | .081                | .004  | .037  |      |
| 35.0                       | .163               | .755  | .042                | -.011 | 125.0          |  | .206               | -.320 | .077                | .004  | .038  |      |
| 40.0                       | .188               | .720  | .046                | -.005 | 130.0          |  | .194               | -.376 | .072                | .004  | .038  |      |
| 45.0                       | .210               | .672  | .051                | .002  | 135.0          |  | .176               | -.438 | .067                | .004  | .038  |      |
| 50.0                       | .230               | .625  | .058                | .006  | 140.0          |  | .160               | -.490 | .060                | .004  | .038  |      |
| 55.0                       | .241               | .560  | .066                | .010  | 145.0          |  | .141               | -.551 | .053                | .003  | .036  |      |
| 60.0                       | .250               | .515  | .073                | .010  | 150.0          |  | .120               | -.605 | .045                | .002  | .038  |      |
| 65.0                       | .248               | .442  | .078                | .010  | 155.0          |  | .097               | -.644 | .037                | .002  | .037  |      |
| 70.0                       | .245               | .363  | .082                | .008  | 160.0          |  | .074               | -.679 | .029                | .001  | .037  |      |
| 75.0                       | .236               | .276  | .086                | .004  | 165.0          |  | .049               | -.709 | .021                | .001  | .037  |      |
| 80.0                       | .232               | .171  | .088                | .000  | 170.0          |  | .024               | -.730 | .012                | .001  | .037  |      |
| 85.0                       | .232               | .095  | .089                | -.002 | 175.0          |  | .050               | -.740 | .002                | .001  | .036  |      |
| 90.0                       | .240               | .000  | .089                | -.004 | 180.0          |  | -.008              | -.740 | -.008               | .001  | .036  |      |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 20.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|-----------------|--------------|------|---------------------|-------|
|                | AXIAL              | SIDE  | PITCH               | ROLL  |                |                 | AXIAL        | SIDE | PITCH               | ROLL  |
| 0              | .019               | .814  | .054                | .011  | 90.0           | .222            | -.001        | .083 | .078                | -.003 |
| 5.0            | .036               | .811  | .048                | .009  | 95.0           | .223            | -.071        | .082 | .078                | -.003 |
| 10.0           | .052               | .804  | .043                | .007  | 100.0          | .223            | -.125        | .080 | .072                | -.002 |
| 15.0           | .071               | .808  | .038                | -.001 | 105.0          | .223            | -.165        | .081 | .078                | -.001 |
| 20.0           | .091               | .798  | .035                | -.004 | 110.0          | .220            | -.198        | .082 | .077                | .001  |
| 25.0           | .115               | .785  | .033                | -.006 | 115.0          | .214            | -.230        | .083 | .074                | .003  |
| 30.0           | .136               | .765  | .033                | -.008 | 120.0          | .207            | -.257        | .086 | .071                | .003  |
| 35.0           | .160               | .736  | .035                | -.009 | 125.0          | .198            | -.296        | .089 | .070                | .003  |
| 40.0           | .184               | .701  | .039                | -.004 | 130.0          | .190            | -.347        | .093 | .070                | .003  |
| 45.0           | .206               | .654  | .045                | .000  | 135.0          | .177            | -.403        | .097 | .070                | .002  |
| 50.0           | .224               | .608  | .053                | .003  | 140.0          | .164            | -.454        | .100 | .065                | .002  |
| 55.0           | .234               | .544  | .062                | .006  | 145.0          | .149            | -.512        | .103 | .056                | .000  |
| 60.0           | .240               | .490  | .068                | .006  | 150.0          | .132            | -.563        | .106 | .043                | .000  |
| 65.0           | .238               | .414  | .071                | .006  | 155.0          | .113            | -.602        | .068 | .033                | .000  |
| 70.0           | .235               | .354  | .073                | .004  | 160.0          | .092            | -.635        | .110 | .025                | .000  |
| 75.0           | .227               | .245  | .075                | .001  | 165.0          | .068            | -.662        | .111 | .018                | .000  |
| 80.0           | .221               | .148  | .077                | -.001 | 170.0          | .043            | -.681        | .113 | .011                | .001  |
| 85.0           | .219               | .076  | .078                | -.002 | 175.0          | .049            | -.690        | .114 | .005                | .002  |
| 90.0           | .222               | -.001 | .078                | -.003 | 180.0          | .002            | -.693        | .115 | -.002               | .005  |

\*\*\*AZIMUTH ANGLE = 25.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|-----------------|--------------|------|---------------------|-------|
|                | AXIAL              | SIDE  | PITCH               | ROLL  |                |                 | AXIAL        | SIDE | PITCH               | ROLL  |
| 0              | .019               | .807  | .052                | .005  | 90.0           | .204            | -.002        | .098 | .067                | -.002 |
| 5.0            | .036               | .802  | .045                | .004  | 95.0           | .202            | -.078        | .096 | .068                | -.002 |
| 10.0           | .052               | .797  | .039                | .004  | 100.0          | .200            | -.130        | .094 | .067                | -.001 |
| 15.0           | .072               | .794  | .033                | .000  | 105.0          | .199            | -.165        | .095 | .070                | -.001 |
| 20.0           | .092               | .784  | .029                | -.001 | 110.0          | .199            | -.191        | .098 | .068                | .000  |
| 25.0           | .114               | .770  | .027                | -.003 | 115.0          | .197            | -.215        | .101 | .064                | .002  |
| 30.0           | .134               | .750  | .027                | -.005 | 120.0          | .194            | -.238        | .106 | .062                | .002  |
| 35.0           | .158               | .718  | .029                | -.007 | 125.0          | .190            | -.272        | .112 | .063                | .002  |
| 40.0           | .181               | .682  | .033                | -.004 | 130.0          | .186            | -.318        | .120 | .068                | .002  |
| 45.0           | .202               | .637  | .039                | -.001 | 135.0          | .179            | -.369        | .128 | .073                | .001  |
| 50.0           | .218               | .591  | .048                | .000  | 140.0          | .169            | -.418        | .135 | .070                | .000  |
| 55.0           | .227               | .529  | .058                | .002  | 145.0          | .157            | -.473        | .142 | .059                | -.001 |
| 60.0           | .231               | .466  | .053                | .003  | 150.0          | .144            | -.521        | .147 | .041                | -.002 |
| 65.0           | .228               | .387  | .054                | .002  | 155.0          | .129            | -.561        | .131 | .029                | -.002 |
| 70.0           | .225               | .305  | .055                | .001  | 160.0          | .110            | -.591        | .154 | .021                | -.001 |
| 75.0           | .218               | .215  | .055                | .000  | 165.0          | .087            | -.616        | .156 | .016                | .000  |
| 80.0           | .211               | .125  | .056                | -.002 | 170.0          | .053            | -.634        | .158 | .011                | .001  |
| 85.0           | .206               | .057  | .057                | -.002 | 175.0          | .048            | -.641        | .160 | .008                | .003  |
| 90.0           | .204               | -.002 | .057                | -.002 | 180.0          | .004            | -.646        | .161 | .004                | .009  |

Table A-4 cont'd

| ***AZIMUTH ANGLE = 30.0**** |              |                          |                         |              |                          |                         |             |              |                          |                         |              |                          |                         |
|-----------------------------|--------------|--------------------------|-------------------------|--------------|--------------------------|-------------------------|-------------|--------------|--------------------------|-------------------------|--------------|--------------------------|-------------------------|
| ELEV. ANGLE                 | FORCE NORMAL | FORCE COEFFICIENTS AXIAL | FORCE COEFFICIENTS SIDE | MOMENT PITCH | MOMENT COEFFICIENTS ROLL | MOMENT COEFFICIENTS YAW | ELEV. ANGLE | FORCE NORMAL | FORCE COEFFICIENTS AXIAL | FORCE COEFFICIENTS SIDE | MOMENT PITCH | MOMENT COEFFICIENTS ROLL | MOMENT COEFFICIENTS YAW |
| 0                           | .020         | .800                     | .118                    | .050         | -.001                    | .015                    | 90.0        | .187         | -.003                    | .113                    | .057         | -.002                    | .024                    |
| 5.0                         | .037         | .793                     | .125                    | .043         | .000                     | .015                    | 95.0        | .182         | -.085                    | .110                    | .059         | -.001                    | .035                    |
| 10.0                        | .052         | .790                     | .132                    | .035         | .001                     | .014                    | 100.0       | .177         | -.135                    | .108                    | .062         | -.001                    | .037                    |
| 15.0                        | .073         | .780                     | .138                    | .028         | .001                     | .014                    | 105.0       | .176         | -.165                    | .110                    | .062         | -.001                    | .040                    |
| 20.0                        | .093         | .771                     | .143                    | .023         | .001                     | .013                    | 110.0       | .178         | -.185                    | .114                    | .060         | .000                     | .042                    |
| 25.0                        | .113         | .755                     | .148                    | .021         | .000                     | .012                    | 115.0       | .180         | -.200                    | .119                    | .054         | .001                     | .049                    |
| 30.0                        | .133         | .735                     | .152                    | .021         | -.002                    | .013                    | 120.0       | .182         | -.219                    | .127                    | .053         | .001                     | .054                    |
| 35.0                        | .156         | .700                     | .154                    | .023         | -.006                    | .014                    | 125.0       | .183         | -.248                    | .136                    | .056         | .001                     | .060                    |
| 40.0                        | .178         | .664                     | .156                    | .027         | -.004                    | .018                    | 130.0       | .183         | -.289                    | .147                    | .067         | .001                     | .066                    |
| 45.0                        | .198         | .620                     | .156                    | .034         | -.003                    | .022                    | 135.0       | .181         | -.335                    | .159                    | .076         | .000                     | .072                    |
| 50.0                        | .212         | .575                     | .156                    | .044         | -.002                    | .027                    | 140.0       | .174         | -.362                    | .171                    | .075         | -.002                    | .074                    |
| 55.0                        | .220         | .514                     | .156                    | .054         | -.002                    | .030                    | 145.0       | .166         | -.435                    | .181                    | .063         | -.004                    | .076                    |
| 60.0                        | .222         | .442                     | .150                    | .058         | .000                     | .032                    | 150.0       | .157         | -.480                    | .188                    | .039         | -.005                    | .077                    |
| 65.0                        | .219         | .360                     | .143                    | .058         | -.001                    | .032                    | 155.0       | .145         | -.520                    | .194                    | .026         | -.004                    | .078                    |
| 70.0                        | .216         | .276                     | .136                    | .057         | -.002                    | .032                    | 160.0       | .129         | -.548                    | .198                    | .017         | -.003                    | .078                    |
| 75.0                        | .210         | .185                     | .129                    | .055         | -.003                    | .032                    | 165.0       | .107         | -.570                    | .201                    | .013         | -.001                    | .078                    |
| 80.0                        | .201         | .102                     | .123                    | .055         | -.003                    | .032                    | 170.0       | .082         | -.584                    | .204                    | .011         | .002                     | .078                    |
| 85.0                        | .194         | .038                     | .117                    | .056         | -.002                    | .023                    | 175.0       | .048         | -.592                    | .206                    | .011         | .005                     | .078                    |
| 90.0                        | .187         | -.003                    | .113                    | .057         | -.002                    | .024                    | 180.0       | .010         | -.600                    | .208                    | .010         | .014                     | .079                    |

| ***AZIMUTH ANGLE = 35.0**** |              |                          |                         |              |                          |                         |             |              |                          |                         |              |                          |                         |
|-----------------------------|--------------|--------------------------|-------------------------|--------------|--------------------------|-------------------------|-------------|--------------|--------------------------|-------------------------|--------------|--------------------------|-------------------------|
| ELEV. ANGLE                 | FORCE NORMAL | FORCE COEFFICIENTS AXIAL | FORCE COEFFICIENTS SIDE | MOMENT PITCH | MOMENT COEFFICIENTS ROLL | MOMENT COEFFICIENTS YAW | ELEV. ANGLE | FORCE NORMAL | FORCE COEFFICIENTS AXIAL | FORCE COEFFICIENTS SIDE | MOMENT PITCH | MOMENT COEFFICIENTS ROLL | MOMENT COEFFICIENTS YAW |
| 0                           | .020         | .766                     | .147                    | .042         | -.001                    | .022                    | 90.0        | .176         | -.015                    | .131                    | .051         | -.002                    | .038                    |
| 5.0                         | .036         | .759                     | .154                    | .037         | -.001                    | .021                    | 95.0        | .171         | -.088                    | .128                    | .052         | -.001                    | .046                    |
| 10.0                        | .051         | .757                     | .161                    | .031         | -.001                    | .020                    | 100.0       | .167         | -.129                    | .126                    | .054         | -.001                    | .047                    |
| 15.0                        | .071         | .747                     | .166                    | .026         | -.002                    | .020                    | 105.0       | .166         | -.163                    | .127                    | .055         | .000                     | .049                    |
| 20.0                        | .090         | .739                     | .170                    | .023         | -.003                    | .019                    | 110.0       | .168         | -.186                    | .130                    | .054         | .000                     | .051                    |
| 25.0                        | .109         | .720                     | .174                    | .021         | -.004                    | .019                    | 115.0       | .169         | -.207                    | .134                    | .051         | .001                     | .056                    |
| 30.0                        | .128         | .701                     | .176                    | .020         | -.006                    | .020                    | 120.0       | .170         | -.226                    | .141                    | .051         | .001                     | .060                    |
| 35.0                        | .148         | .683                     | .176                    | .020         | -.008                    | .021                    | 125.0       | .169         | -.250                    | .150                    | .054         | .001                     | .065                    |
| 40.0                        | .167         | .629                     | .177                    | .020         | -.006                    | .025                    | 130.0       | .168         | -.285                    | .160                    | .062         | .000                     | .070                    |
| 45.0                        | .185         | .591                     | .176                    | .024         | -.005                    | .030                    | 135.0       | .158         | -.320                    | .168                    | .068         | -.001                    | .075                    |
| 50.0                        | .197         | .544                     | .175                    | .034         | -.003                    | .035                    | 140.0       | .158         | -.356                    | .183                    | .066         | -.002                    | .077                    |
| 55.0                        | .204         | .489                     | .174                    | .045         | -.002                    | .039                    | 145.0       | .149         | -.396                    | .193                    | .056         | -.001                    | .082                    |
| 60.0                        | .207         | .421                     | .168                    | .051         | .000                     | .041                    | 150.0       | .140         | -.431                    | .199                    | .037         | -.004                    | .081                    |
| 65.0                        | .205         | .347                     | .161                    | .052         | -.001                    | .042                    | 155.0       | .127         | -.462                    | .205                    | .027         | -.003                    | .082                    |
| 70.0                        | .202         | .267                     | .154                    | .052         | -.001                    | .042                    | 160.0       | .112         | -.482                    | .209                    | .019         | -.002                    | .083                    |
| 75.0                        | .197         | .181                     | .147                    | .051         | -.002                    | .043                    | 165.0       | .092         | -.506                    | .213                    | .015         | .000                     | .083                    |
| 80.0                        | .189         | .103                     | .141                    | .051         | -.002                    | .043                    | 170.0       | .070         | -.513                    | .216                    | .012         | .003                     | .084                    |
| 85.0                        | .182         | .033                     | .135                    | .051         | -.002                    | .038                    | 175.0       | .041         | -.521                    | .218                    | .010         | .006                     | .084                    |
| 90.0                        | .176         | -.015                    | .131                    | .051         | -.002                    | .038                    | 180.0       | .010         | -.526                    | .220                    | .009         | .015                     | .085                    |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 40.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     |
|----------------|--------------------|-------|---------------------|-------|----------------|-----------------|--------------------|------|---------------------|-------|----------------|-----------------|--------------------|-------|---------------------|-----|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                |                 | ROLL               | YAW  | NORMAL              | AXIAL |                |                 | SIDE               | PITCH | ROLL                | YAW |
| 0              | .021               | .733  | .176                | .034  | 90.0           | .165            | -.001              | .029 | 90.0                | .165  | -.027          | .149            | .046               | -.002 | .053                |     |
| 5.0            | .036               | .725  | .183                | .031  | 95.0           | .161            | -.003              | .028 | 95.0                | .161  | -.091          | .146            | .046               | -.001 | .057                |     |
| 10.0           | .051               | .725  | .190                | .028  | 100.0          | .158            | -.003              | .027 | 100.0               | .158  | -.124          | .144            | .047               | -.001 | .057                |     |
| 15.0           | .069               | .714  | .195                | .025  | 105.0          | .157            | -.006              | .026 | 105.0               | .157  | -.161          | .144            | .048               | .000  | .058                |     |
| 20.0           | .087               | .707  | .197                | .023  | 110.0          | .158            | -.007              | .026 | 110.0               | .158  | -.188          | .146            | .049               | .000  | .060                |     |
| 25.0           | .106               | .685  | .200                | .022  | 115.0          | .158            | -.008              | .026 | 115.0               | .158  | -.214          | .150            | .049               | .001  | .064                |     |
| 30.0           | .123               | .667  | .200                | .020  | 120.0          | .158            | -.010              | .027 | 120.0               | .158  | -.233          | .156            | .050               | .001  | .066                |     |
| 35.0           | .141               | .626  | .199                | .017  | 125.0          | .156            | -.010              | .028 | 125.0               | .156  | -.252          | .164            | .053               | .001  | .070                |     |
| 40.0           | .157               | .595  | .199                | .014  | 130.0          | .153            | -.009              | .032 | 130.0               | .153  | -.281          | .174            | .058               | .000  | .074                |     |
| 45.0           | .172               | .562  | .196                | .014  | 135.0          | .149            | -.007              | .038 | 135.0               | .149  | -.305          | .185            | .060               | -.002 | .078                |     |
| 50.0           | .182               | .513  | .195                | .024  | 140.0          | .142            | -.004              | .043 | 140.0               | .142  | -.330          | .195            | .057               | -.002 | .081                |     |
| 55.0           | .189               | .465  | .192                | .037  | 145.0          | .133            | -.003              | .048 | 145.0               | .133  | -.358          | .205            | .049               | .000  | .088                |     |
| 60.0           | .192               | .400  | .186                | .044  | 150.0          | .123            | -.001              | .051 | 150.0               | .123  | -.383          | .210            | .036               | -.003 | .085                |     |
| 65.0           | .191               | .334  | .179                | .047  | 155.0          | .109            | -.001              | .052 | 155.0               | .109  | -.404          | .216            | .028               | -.002 | .087                |     |
| 70.0           | .188               | .258  | .172                | .048  | 160.0          | .095            | -.001              | .053 | 160.0               | .095  | -.416          | .220            | .021               | -.001 | .088                |     |
| 75.0           | .184               | .177  | .166                | .047  | 165.0          | .078            | -.001              | .054 | 165.0               | .078  | -.443          | .225            | .017               | .000  | .089                |     |
| 80.0           | .177               | .104  | .160                | .047  | 170.0          | .058            | -.001              | .055 | 170.0               | .058  | -.442          | .228            | .013               | .000  | .090                |     |
| 85.0           | .170               | .029  | .154                | .046  | 175.0          | .034            | -.002              | .053 | 175.0               | .034  | -.450          | .230            | .010               | .004  | .090                |     |
| 90.0           | .165               | -.027 | .149                | .046  | 180.0          | .010            | -.002              | .053 | 180.0               | .010  | -.452          | .232            | .008               | .008  | .091                |     |

\*\*\*AZIMUTH ANGLE = 45.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | AXIAL               | SIDE |                |                 | PITCH              | ROLL | PITCH               | YAW   |      |
| 0              | .022               | .700  | .205                | .205 | 90.0           | .154            | -.040              | .168 | .041                | -.002 | .068 |
| 5.0            | .036               | .691  | .212                | .212 | 95.0           | .151            | -.095              | .164 | .040                | -.002 | .068 |
| 10.0           | .051               | .693  | .220                | .220 | 100.0          | .149            | -.119              | .163 | .040                | -.001 | .068 |
| 15.0           | .068               | .682  | .224                | .224 | 105.0          | .148            | -.159              | .162 | .041                | .000  | .068 |
| 20.0           | .085               | .676  | .225                | .225 | 110.0          | .148            | -.190              | .163 | .044                | .001  | .070 |
| 25.0           | .103               | .650  | .226                | .226 | 115.0          | .147            | -.221              | .166 | .047                | .002  | .072 |
| 30.0           | .119               | .634  | .224                | .224 | 120.0          | .146            | -.240              | .171 | .049                | .002  | .073 |
| 35.0           | .134               | .590  | .221                | .221 | 125.0          | .143            | -.255              | .179 | .052                | .001  | .076 |
| 40.0           | .147               | .561  | .222                | .222 | 130.0          | .138            | -.278              | .188 | .054                | -.001 | .078 |
| 45.0           | .159               | .533  | .216                | .216 | 135.0          | .133            | -.290              | .198 | .053                | .003  | .082 |
| 50.0           | .168               | .482  | .215                | .215 | 140.0          | .126            | -.305              | .208 | .049                | -.003 | .085 |
| 55.0           | .174               | .441  | .210                | .210 | 145.0          | .117            | -.320              | .218 | .042                | .003  | .094 |
| 60.0           | .177               | .380  | .205                | .205 | 150.0          | .106            | -.335              | .222 | .035                | -.003 | .090 |
| 65.0           | .178               | .321  | .197                | .197 | 155.0          | .091            | -.347              | .227 | .029                | .002  | .092 |
| 70.0           | .175               | .249  | .191                | .191 | 160.0          | .079            | -.350              | .231 | .023                | -.001 | .094 |
| 75.0           | .171               | .173  | .185                | .185 | 165.0          | .064            | -.380              | .237 | .019                | .001  | .095 |
| 80.0           | .165               | .105  | .179                | .179 | 170.0          | .046            | -.371              | .240 | .014                | .005  | .096 |
| 85.0           | .159               | .025  | .173                | .173 | 175.0          | .027            | -.379              | .243 | .010                | .010  | .096 |
| 90.0           | .154               | -.040 | .168                | .168 | 180.0          | .010            | -.379              | .245 | .008                | .018  | .098 |

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Table A-4 cont'd

| ***AZIMUTH ANGLE = 50.0*** |                    |       |                     |       |                |                 |                    |      |                     |       |                |
|----------------------------|--------------------|-------|---------------------|-------|----------------|-----------------|--------------------|------|---------------------|-------|----------------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |
|                            | NORMAL             | AXIAL | SIDE                | PITCH |                |                 | AXIAL              | SIDE | PITCH               | ROLL  |                |
| 0                          | .020               | .633  | .220                | .035  | .006           | .046            | .134               | .170 | .035                | -.002 | .065           |
| 5.0                        | .032               | .631  | .226                | .034  | .004           | .045            | .131               | .167 | .035                | -.002 | .066           |
| 10.0                       | .046               | .632  | .232                | .034  | .003           | .046            | .129               | .166 | .036                | -.001 | .067           |
| 15.0                       | .061               | .621  | .235                | .032  | -.001          | .046            | .128               | .166 | .037                | .000  | .069           |
| 20.0                       | .076               | .614  | .235                | .031  | -.003          | .047            | .128               | .169 | .040                | .000  | .072           |
| 25.0                       | .092               | .590  | .235                | .031  | -.005          | .048            | .126               | .173 | .042                | .001  | .075           |
| 30.0                       | .106               | .573  | .234                | .028  | -.005          | .049            | .125               | .179 | .042                | .002  | .077           |
| 35.0                       | .119               | .535  | .231                | .024  | -.005          | .051            | .122               | .188 | .044                | .001  | .081           |
| 40.0                       | .130               | .501  | .229                | .019  | -.005          | .054            | .118               | .197 | .044                | .000  | .084           |
| 45.0                       | .140               | .473  | .224                | .016  | -.003          | .058            | .113               | .206 | .042                | -.001 | .089           |
| 50.0                       | .147               | .424  | .222                | .021  | -.002          | .061            | .107               | .216 | .038                | -.001 | .092           |
| 55.0                       | .152               | .380  | .216                | .029  | -.002          | .062            | .100               | .225 | .032                | .002  | .099           |
| 60.0                       | .155               | .320  | .211                | .033  | -.001          | .063            | .090               | .230 | .026                | -.001 | .097           |
| 65.0                       | .155               | .266  | .203                | .035  | -.001          | .063            | .078               | .235 | .021                | .000  | .099           |
| 70.0                       | .153               | .202  | .196                | .035  | -.001          | .062            | .067               | .239 | .017                | .001  | .101           |
| 75.0                       | .149               | .139  | .188                | .034  | -.001          | .063            | .054               | .244 | .013                | .003  | .102           |
| 80.0                       | .144               | .084  | .181                | .034  | -.002          | .063            | .038               | .246 | .009                | .007  | .103           |
| 85.0                       | .139               | .016  | .175                | .034  | -.002          | .065            | .021               | .249 | .005                | .013  | .103           |
| 90.0                       | .134               | -.033 | .170                | .035  | -.002          | .065            | .004               | .251 | .004                | .022  | .104           |
| ***AZIMUTH ANGLE = 55.0*** |                    |       |                     |       |                |                 |                    |      |                     |       |                |
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE |
|                            | NORMAL             | AXIAL | SIDE                | PITCH | ROLL           |                 | AXIAL              | SIDE | PITCH               | ROLL  |                |
| 0                          | .018               | .566  | .235                | .044  | .015           | .056            | .115               | .172 | .029                | -.002 | .063           |
| 5.0                        | .029               | .571  | .240                | .043  | .013           | .056            | .112               | .170 | .030                | -.002 | .065           |
| 10.0                       | .041               | .572  | .244                | .043  | .012           | .058            | .110               | .169 | .032                | -.001 | .067           |
| 15.0                       | .054               | .560  | .246                | .041  | .006           | .060            | .108               | .171 | .034                | .000  | .070           |
| 20.0                       | .067               | .552  | .246                | .040  | .005           | .062            | .108               | .175 | .036                | .000  | .074           |
| 25.0                       | .081               | .531  | .244                | .039  | .003           | .063            | .106               | .181 | .037                | .001  | .078           |
| 30.0                       | .094               | .512  | .244                | .036  | .002           | .064            | .104               | .188 | .036                | .002  | .082           |
| 35.0                       | .105               | .480  | .240                | .033  | .002           | .066            | .102               | .197 | .036                | .001  | .087           |
| 40.0                       | .113               | .442  | .237                | .030  | .002           | .069            | .098               | .206 | .034                | .001  | .091           |
| 45.0                       | .121               | .414  | .233                | .027  | .002           | .071            | .094               | .215 | .031                | .000  | .096           |
| 50.0                       | .127               | .367  | .229                | .028  | .002           | .070            | .088               | .224 | .027                | .000  | .099           |
| 55.0                       | .130               | .319  | .223                | .030  | .000           | .068            | .083               | .232 | .022                | .002  | .104           |
| 60.0                       | .133               | .261  | .217                | .029  | -.001          | .065            | .074               | .238 | .017                | .000  | .104           |
| 65.0                       | .133               | .212  | .209                | .028  | -.002          | .063            | .065               | .243 | .013                | .002  | .106           |
| 70.0                       | .131               | .156  | .201                | .026  | -.002          | .060            | .055               | .247 | .011                | .003  | .108           |
| 75.0                       | .128               | .106  | .192                | .025  | -.002          | .060            | .040               | .251 | .007                | .005  | .109           |
| 80.0                       | .124               | .063  | .183                | .026  | -.003          | .060            | .030               | .252 | .004                | .010  | .110           |
| 85.0                       | .119               | .008  | .177                | .027  | -.003          | .062            | .015               | .255 | .000                | .016  | .110           |
| 90.0                       | .115               | -.026 | .172                | .029  | -.002          | .063            | .000               | .257 | .000                | .027  | .111           |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 60.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |     |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-----|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | ROLL               | YAW   | NORMAL              | AXIAL |                | SIDE               | PITCH | ROLL                | YAW |
| 0              | .017               | .500  | .250                | .053  | .024           | .066               | .096  | -.020               | .175  | .023           | -.003              | .061  |                     |     |
| 5.0            | .026               | .512  | .254                | .052  | .023           | .067               | .093  | -.060               | .173  | .026           | -.002              | .064  |                     |     |
| 10.0           | .036               | .512  | .256                | .052  | .021           | .071               | .091  | -.079               | .173  | .029           | -.002              | .067  |                     |     |
| 15.0           | .047               | .500  | .258                | .050  | .015           | .074               | .089  | -.095               | .176  | .031           | .000               | .072  |                     |     |
| 20.0           | .059               | .490  | .257                | .049  | .014           | .077               | .088  | -.095               | .182  | .032           | .000               | .077  |                     |     |
| 25.0           | .070               | .472  | .254                | .047  | .011           | .078               | .086  | -.119               | .189  | .032           | .001               | .082  |                     |     |
| 30.0           | .082               | .452  | .255                | .045  | .011           | .080               | .084  | -.122               | .197  | .030           | .002               | .087  |                     |     |
| 35.0           | .091               | .425  | .250                | .043  | .010           | .081               | .082  | -.139               | .206  | .028           | .002               | .093  |                     |     |
| 40.0           | .097               | .383  | .246                | .042  | .009           | .084               | .079  | -.173               | .215  | .025           | .002               | .098  |                     |     |
| 45.0           | .103               | .355  | .242                | .039  | .008           | .084               | .075  | -.175               | .224  | .021           | .001               | .103  |                     |     |
| 50.0           | .107               | .310  | .236                | .035  | .006           | .080               | .070  | -.186               | .233  | .016           | .001               | .106  |                     |     |
| 55.0           | .109               | .258  | .230                | .031  | .002           | .074               | .066  | -.195               | .239  | .012           | .002               | .109  |                     |     |
| 60.0           | .111               | .202  | .224                | .025  | .001           | .068               | .059  | -.205               | .246  | .009           | .002               | .112  |                     |     |
| 65.0           | .111               | .158  | .216                | .021  | -.003          | .064               | .053  | -.200               | .251  | .006           | .004               | .113  |                     |     |
| 70.0           | .110               | .110  | .206                | .018  | -.003          | .059               | .044  | -.204               | .255  | .005           | .005               | .115  |                     |     |
| 75.0           | .107               | .073  | .196                | .017  | -.003          | .057               | .035  | -.211               | .259  | .001           | .008               | .117  |                     |     |
| 80.0           | .104               | .042  | .186                | .018  | -.004          | .057               | .023  | -.215               | .259  | -.001          | .013               | .117  |                     |     |
| 85.0           | .100               | .000  | .179                | .020  | -.004          | .059               | .010  | -.217               | .261  | -.004          | .020               | .118  |                     |     |
| 90.0           | .096               | -.020 | .175                | .023  | -.003          | .061               | -.006 | -.217               | .263  | -.004          | .032               | .118  |                     |     |

\*\*\*AZIMUTH ANGLE = 65.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |       |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|-------|-------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | ROLL               | YAW   | NORMAL              | AXIAL | SIDE  | PITCH |
| 0              | .014               | .400  | .246                | .047  | 90.0           | .077               | -.023 | .181                | .013  | -.004 | .068  |
| 5.0            | .022               | .408  | .249                | .046  | 95.0           | .075               | -.053 | .179                | .014  | -.003 | .070  |
| 10.0           | .029               | .404  | .251                | .045  | 100.0          | .074               | -.072 | .179                | .013  | -.003 | .072  |
| 15.0           | .038               | .397  | .253                | .043  | 105.0          | .073               | -.086 | .174                | .014  | -.002 | .076  |
| 20.0           | .047               | .390  | .253                | .041  | 110.0          | .072               | -.096 | .184                | .014  | -.002 | .079  |
| 25.0           | .056               | .374  | .250                | .038  | 115.0          | .070               | -.109 | .189                | .013  | -.001 | .082  |
| 30.0           | .065               | .361  | .251                | .035  | 120.0          | .068               | -.114 | .191                | .011  | .000  | .086  |
| 35.0           | .073               | .341  | .247                | .032  | 125.0          | .066               | -.127 | .201                | .009  | .000  | .090  |
| 40.0           | .078               | .309  | .243                | .031  | 130.0          | .063               | -.150 | .208                | .007  | .001  | .093  |
| 45.0           | .082               | .283  | .239                | .029  | 135.0          | .060               | -.154 | .215                | .004  | -.001 | .098  |
| 50.0           | .085               | .250  | .237                | .027  | 140.0          | .056               | -.162 | .221                | .001  | .000  | .099  |
| 55.0           | .085               | .210  | .227                | .025  | 145.0          | .052               | -.170 | .226                | -.001 | .000  | .101  |
| 60.0           | .086               | .137  | .221                | .022  | 150.0          | .046               | -.188 | .232                | -.003 | .000  | .103  |
| 65.0           | .086               | .130  | .214                | .019  | 155.0          | .041               | -.177 | .236                | -.005 | .001  | .103  |
| 70.0           | .086               | .091  | .205                | .016  | 160.0          | .034               | -.183 | .239                | -.006 | .002  | .105  |
| 75.0           | .084               | .057  | .197                | .014  | 165.0          | .026               | -.189 | .242                | -.008 | .005  | .107  |
| 80.0           | .083               | .029  | .189                | .014  | 170.0          | .017               | -.193 | .243                | -.010 | .010  | .107  |
| 85.0           | .080               | .005  | .184                | .013  | 175.0          | .006               | -.194 | .244                | -.011 | .016  | .108  |
| 90.0           | .077               | -.023 | .181                | .013  | 180.0          | -.006              | -.191 | .246                | -.010 | .026  | .107  |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 70.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | ROLL                | YAW  |                |                 | AXIAL              | SIDE | PITCH               | ROLL  |
| 0              | .011               | .300  | .023                | .072 | 90.0           | .059            | -.026              | .187 | .003                | -.006 |
| 5.0            | .018               | .304  | .021                | .071 | 95.0           | .058            | -.046              | .185 | .002                | -.005 |
| 10.0           | .022               | .297  | .015                | .073 | 100.0          | .058            | -.065              | .185 | -.001               | -.004 |
| 15.0           | .026               | .294  | .009                | .072 | 105.0          | .057            | -.077              | .172 | -.002               | -.004 |
| 20.0           | .035               | .290  | .004                | .072 | 110.0          | .056            | -.087              | .187 | -.003               | -.004 |
| 25.0           | .042               | .277  | .000                | .072 | 115.0          | .054            | -.099              | .189 | -.005               | -.004 |
| 30.0           | .049               | .271  | .001                | .072 | 120.0          | .053            | -.107              | .186 | -.008               | -.003 |
| 35.0           | .055               | .256  | .002                | .073 | 125.0          | .051            | -.116              | .196 | -.009               | -.003 |
| 40.0           | .059               | .235  | .002                | .075 | 130.0          | .048            | -.127              | .201 | -.011               | .000  |
| 45.0           | .062               | .211  | .002                | .076 | 135.0          | .045            | -.133              | .206 | -.012               | -.003 |
| 50.0           | .063               | .190  | .004                | .075 | 140.0          | .042            | -.139              | .210 | -.014               | -.002 |
| 55.0           | .061               | .162  | .005                | .075 | 145.0          | .038            | -.145              | .214 | -.015               | -.002 |
| 60.0           | .061               | .073  | .006                | .073 | 150.0          | .033            | -.171              | .218 | -.016               | -.002 |
| 65.0           | .061               | .102  | .007                | .073 | 155.0          | .029            | -.155              | .221 | -.017               | .000  |
| 70.0           | .062               | .073  | .007                | .072 | 160.0          | .024            | -.162              | .224 | -.017               | .000  |
| 75.0           | .062               | .041  | .007                | .072 | 165.0          | .017            | -.167              | .226 | -.018               | .003  |
| 80.0           | .062               | .017  | .007                | .073 | 170.0          | .011            | -.171              | .227 | -.019               | .008  |
| 85.0           | .060               | -.010 | .007                | .074 | 175.0          | .002            | -.172              | .228 | -.018               | .012  |
| 90.0           | .059               | -.026 | .006                | .075 | 180.0          | -.006           | -.165              | .229 | -.017               | .020  |

\*\*\*AZIMUTH ANGLE = 75.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|-----------------|--------------------|------|---------------------|-------|
|                | NORMAL             | AXIAL | ROLL                | YAW  |                |                 | AXIAL              | SIDE | PITCH               | ROLL  |
| 0              | .009               | .200  | .023                | .076 | 90.0           | .041            | -.030              | .193 | -.006               | -.008 |
| 5.0            | .015               | .200  | .020                | .074 | 95.0           | .041            | -.040              | .192 | -.010               | -.007 |
| 10.0           | .016               | .190  | .013                | .075 | 100.0          | .042            | -.059              | .191 | -.017               | -.006 |
| 15.0           | .020               | .191  | .007                | .071 | 105.0          | .041            | -.069              | .171 | -.019               | -.007 |
| 20.0           | .024               | .191  | .000                | .070 | 110.0          | .041            | -.079              | .190 | -.021               | -.007 |
| 25.0           | .028               | .180  | .005                | .070 | 115.0          | .039            | -.089              | .190 | -.024               | -.007 |
| 30.0           | .033               | .181  | .007                | .069 | 120.0          | .038            | -.100              | .181 | -.027               | -.006 |
| 35.0           | .037               | .175  | .008                | .070 | 125.0          | .036            | -.105              | .192 | -.028               | -.006 |
| 40.0           | .040               | .162  | .008                | .071 | 130.0          | .033            | -.105              | .194 | -.029               | .000  |
| 45.0           | .042               | .140  | .008                | .072 | 135.0          | .030            | -.112              | .197 | -.029               | -.005 |
| 50.0           | .041               | .130  | .009                | .073 | 140.0          | .028            | -.116              | .199 | -.029               | -.004 |
| 55.0           | .037               | .115  | .009                | .076 | 145.0          | .025            | -.120              | .202 | -.029               | -.004 |
| 60.0           | .037               | .099  | .009                | .076 | 150.0          | .021            | -.155              | .204 | -.029               | -.004 |
| 65.0           | .036               | .075  | .009                | .078 | 155.0          | .018            | -.133              | .206 | -.029               | -.003 |
| 70.0           | .038               | .055  | .009                | .079 | 160.0          | .014            | -.141              | .209 | -.029               | -.003 |
| 75.0           | .040               | .025  | .009                | .080 | 165.0          | .009            | -.146              | .210 | -.028               | .001  |
| 80.0           | .041               | -.005 | .009                | .081 | 170.0          | .005            | -.150              | .211 | -.028               | .006  |
| 85.0           | .041               | -.015 | .009                | .082 | 175.0          | -.001           | -.150              | .212 | -.026               | .009  |
| 90.0           | .041               | -.030 | .008                | .083 | 180.0          | -.006           | -.140              | .212 | -.024               | .015  |



Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 80.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE |      |       | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|------|-------|--------------------|-------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                |      |       | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| 0              | .007               | .106  | .222 | .035                | .016  | .070 | 90.0           | .028 | .034  | .187               | 90.0  | .028 | -.005               | -.005 | .072 |
| 5.0            | .012               | .106  | .223 | .030                | .014  | .068 | 95.0           | .028 | -.041 | .186               | 95.0  | .028 | -.008               | -.005 | .072 |
| 10.0           | .012               | .124  | .225 | .027                | .009  | .069 | 100.0          | .028 | -.054 | .185               | 100.0 | .028 | -.011               | -.004 | .072 |
| 15.0           | .015               | .104  | .226 | .023                | .004  | .065 | 105.0          | .027 | -.061 | .172               | 105.0 | .027 | -.012               | -.005 | .073 |
| 20.0           | .017               | .104  | .226 | .020                | .000  | .064 | 110.0          | .026 | -.068 | .184               | 110.0 | .026 | -.014               | -.005 | .073 |
| 25.0           | .020               | .100  | .225 | .016                | -.004 | .063 | 115.0          | .024 | -.076 | .184               | 115.0 | .024 | -.016               | -.004 | .074 |
| 30.0           | .023               | .100  | .224 | .012                | -.006 | .062 | 120.0          | .024 | -.083 | .178               | 120.0 | .024 | -.019               | -.003 | .076 |
| 35.0           | .026               | .096  | .222 | .008                | -.007 | .062 | 125.0          | .022 | -.086 | .186               | 125.0 | .022 | -.019               | -.004 | .075 |
| 40.0           | .028               | .091  | .219 | .005                | -.007 | .062 | 130.0          | .020 | -.086 | .188               | 130.0 | .020 | -.019               | -.001 | .073 |
| 45.0           | .029               | .076  | .215 | .005                | -.008 | .063 | 135.0          | .018 | -.090 | .191               | 135.0 | .018 | -.018               | -.006 | .075 |
| 50.0           | .028               | .070  | .218 | .007                | -.008 | .064 | 140.0          | .017 | -.094 | .193               | 140.0 | .017 | -.019               | -.006 | .072 |
| 55.0           | .026               | .060  | .206 | .010                | -.007 | .067 | 145.0          | .015 | -.098 | .196               | 145.0 | .015 | -.023               | -.003 | .072 |
| 60.0           | .026               | -.009 | .201 | .011                | -.006 | .069 | 150.0          | .012 | -.123 | .197               | 150.0 | .012 | -.021               | -.006 | .072 |
| 65.0           | .025               | .034  | .197 | .010                | -.006 | .071 | 155.0          | .010 | -.109 | .199               | 155.0 | .010 | -.023               | -.005 | .072 |
| 70.0           | .027               | .021  | .193 | .008                | -.006 | .071 | 160.0          | .007 | -.116 | .202               | 160.0 | .007 | -.024               | -.005 | .074 |
| 75.0           | .028               | .001  | .191 | .005                | -.006 | .071 | 165.0          | .004 | -.121 | .202               | 165.0 | .004 | -.025               | -.001 | .075 |
| 80.0           | .029               | -.011 | .189 | .002                | -.007 | .071 | 170.0          | .001 | -.125 | .203               | 170.0 | .001 | -.027               | .002  | .076 |
| 85.0           | .029               | -.024 | .188 | .001                | -.006 | .071 | 175.0          | .002 | -.126 | .204               | 175.0 | .002 | -.026               | .005  | .077 |
| 90.0           | .028               | -.034 | .187 | .005                | -.005 | .072 | 180.0          | .005 | -.120 | .204               | 180.0 | .005 | -.027               | .010  | .077 |

\*\*\*AZIMUTH ANGLE = 85.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE |      |       | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|------|-------|--------------------|-------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                |      |       | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| 0              | .006               | .012  | .206 | .033                | .009  | .064 | 90.0           | .016 | -.039 | .181               | 90.0  | .016 | -.004               | -.003 | .061 |
| 5.0            | .009               | .013  | .206 | .026                | .008  | .062 | 95.0           | .015 | -.042 | .181               | 95.0  | .015 | -.006               | -.003 | .061 |
| 10.0           | .008               | .058  | .207 | .022                | .005  | .063 | 100.0          | .014 | -.049 | .180               | 100.0 | .014 | -.005               | -.002 | .061 |
| 15.0           | .010               | .017  | .207 | .018                | .002  | .059 | 105.0          | .013 | -.053 | .173               | 105.0 | .013 | -.006               | -.003 | .062 |
| 20.0           | .011               | .017  | .207 | .015                | .000  | .058 | 110.0          | .012 | -.057 | .178               | 110.0 | .012 | -.007               | -.003 | .062 |
| 25.0           | .012               | .020  | .206 | .013                | -.003 | .056 | 115.0          | .010 | -.062 | .178               | 115.0 | .010 | -.008               | -.002 | .065 |
| 30.0           | .013               | .020  | .205 | .009                | -.005 | .055 | 120.0          | .010 | -.066 | .175               | 120.0 | .010 | -.011               | -.001 | .067 |
| 35.0           | .015               | .018  | .203 | .004                | -.006 | .054 | 125.0          | .009 | -.067 | .180               | 125.0 | .009 | -.011               | -.002 | .065 |
| 40.0           | .016               | .020  | .200 | .000                | -.007 | .053 | 130.0          | .008 | -.067 | .182               | 130.0 | .008 | -.009               | -.002 | .061 |
| 45.0           | .016               | .013  | .197 | .000                | -.008 | .054 | 135.0          | .007 | -.069 | .185               | 135.0 | .007 | -.008               | -.007 | .061 |
| 50.0           | .015               | .010  | .197 | .002                | -.007 | .055 | 140.0          | .006 | -.072 | .187               | 140.0 | .006 | -.009               | -.008 | .059 |
| 55.0           | .015               | -.006 | .190 | .005                | -.005 | .058 | 145.0          | .005 | -.076 | .190               | 145.0 | .005 | -.018               | -.002 | .059 |
| 60.0           | .014               | -.007 | .187 | .007                | -.003 | .062 | 150.0          | .003 | -.091 | .191               | 150.0 | .003 | -.014               | -.009 | .059 |
| 65.0           | .014               | -.007 | .184 | .006                | -.003 | .064 | 155.0          | .002 | -.086 | .193               | 155.0 | .002 | -.017               | -.008 | .060 |
| 70.0           | .016               | -.013 | .183 | .004                | -.003 | .063 | 160.0          | .001 | -.091 | .195               | 160.0 | .001 | -.020               | -.007 | .062 |
| 75.0           | .016               | -.022 | .182 | .001                | -.005 | .062 | 165.0          | .000 | -.096 | .195               | 165.0 | .000 | -.023               | -.004 | .063 |
| 80.0           | .017               | -.028 | .182 | .001                | -.005 | .061 | 170.0          | .001 | -.100 | .196               | 170.0 | .001 | -.026               | .000  | .065 |
| 85.0           | .017               | -.034 | .182 | .003                | -.004 | .061 | 175.0          | .003 | -.102 | .196               | 175.0 | .003 | -.027               | .001  | .066 |
| 90.0           | .016               | -.039 | .181 | .004                | -.003 | .061 | 180.0          | .005 | -.101 | .196               | 180.0 | .005 | -.030               | .005  | .067 |

Table A-4 cont'd

| ***AZIMUTH ANGLE = 90.0*** |                    |       |      |                     |       |      |                |                    |       |      |                     |       |      |
|----------------------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|                            | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| .0                         | .005               | -.081 | .190 | .032                | .002  | .058 | 90.0           | .004               | -.044 | .176 | -.004               | -.001 | .051 |
| 5.0                        | .006               | -.080 | .189 | .023                | .002  | .057 | 95.0           | .002               | -.044 | .176 | -.004               | -.001 | .051 |
| 10.0                       | .005               | -.008 | .189 | .017                | .001  | .057 | 100.0          | .000               | -.045 | .175 | .000                | -.001 | .051 |
| 15.0                       | .005               | -.070 | .189 | .013                | .000  | .054 | 105.0          | -.001              | -.046 | .174 | .000                | -.002 | .051 |
| 20.0                       | .005               | -.070 | .188 | .011                | -.001 | .052 | 110.0          | -.002              | -.046 | .173 | .000                | -.001 | .051 |
| 25.0                       | .005               | -.060 | .187 | .010                | -.002 | .050 | 115.0          | -.004              | -.048 | .172 | .000                | .000  | .056 |
| 30.0                       | .004               | -.060 | .186 | .006                | -.004 | .048 | 120.0          | -.004              | -.049 | .173 | -.003               | .001  | .059 |
| 35.0                       | .004               | -.060 | .184 | .001                | -.006 | .046 | 125.0          | -.004              | -.049 | .174 | -.003               | .000  | .055 |
| 40.0                       | .004               | -.050 | .182 | -.005               | -.007 | .045 | 130.0          | -.004              | -.048 | .177 | .000                | -.003 | .049 |
| 45.0                       | .004               | -.050 | .179 | .004                | -.008 | .045 | 135.0          | -.004              | -.048 | .179 | .002                | -.008 | .047 |
| 50.0                       | .003               | -.049 | .177 | -.003               | -.007 | .047 | 140.0          | -.004              | -.050 | .182 | .001                | -.010 | .046 |
| 55.0                       | .004               | -.048 | .175 | .000                | -.004 | .050 | 145.0          | -.005              | -.054 | .184 | -.013               | -.002 | .046 |
| 60.0                       | .004               | -.047 | .173 | .003                | .000  | .056 | 150.0          | -.005              | -.059 | .185 | -.007               | -.012 | .047 |
| 65.0                       | .004               | -.048 | .172 | .002                | .000  | .058 | 155.0          | -.005              | -.063 | .187 | -.012               | -.011 | .048 |
| 70.0                       | .005               | -.047 | .173 | .000                | .000  | .055 | 160.0          | -.005              | -.067 | .188 | -.016               | -.009 | .051 |
| 75.0                       | .005               | -.046 | .174 | -.003               | -.002 | .054 | 165.0          | -.005              | -.071 | .188 | -.021               | -.007 | .052 |
| 80.0                       | .006               | -.045 | .175 | -.005               | -.003 | .051 | 170.0          | -.005              | -.075 | .189 | -.025               | -.004 | .054 |
| 85.0                       | .005               | -.044 | .176 | -.005               | -.002 | .051 | 175.0          | -.005              | -.078 | .189 | -.028               | -.002 | .055 |
| 90.0                       | .004               | -.044 | .176 | -.004               | -.001 | .051 | 180.0          | -.005              | -.082 | .189 | -.033               | -.001 | .058 |

| ***AZIMUTH ANGLE = 95.0*** |                    |       |      |                     |       |      |                |                    |       |      |                     |       |      |
|----------------------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
| ELEV.<br>ANGLE             | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|                            | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| .0                         | .005               | -.100 | .197 | .029                | .006  | .067 | 90.0           | -.011              | -.039 | .181 | .000                | -.003 | .061 |
| 5.0                        | .004               | -.103 | .196 | .024                | .004  | .067 | 95.0           | -.012              | -.034 | .182 | -.002               | -.003 | .061 |
| 10.0                       | .001               | -.055 | .196 | .020                | .002  | .067 | 100.0          | -.013              | -.028 | .182 | -.002               | -.003 | .061 |
| 15.0                       | .000               | -.095 | .196 | .018                | .000  | .065 | 105.0          | -.014              | -.022 | .182 | -.003               | -.004 | .060 |
| 20.0                       | -.001              | -.093 | .195 | .017                | -.001 | .063 | 110.0          | -.014              | -.012 | .183 | -.004               | -.003 | .060 |
| 25.0                       | -.002              | -.084 | .193 | .016                | -.002 | .061 | 115.0          | -.014              | -.007 | .184 | -.005               | -.003 | .063 |
| 30.0                       | -.004              | -.091 | .192 | .013                | -.004 | .060 | 120.0          | -.015              | -.029 | .187 | -.007               | -.002 | .064 |
| 35.0                       | -.005              | -.080 | .190 | .010                | -.005 | .059 | 125.0          | -.015              | .005  | .190 | -.007               | -.002 | .062 |
| 40.0                       | -.006              | -.072 | .187 | .006                | -.008 | .058 | 130.0          | -.016              | .011  | .197 | -.004               | -.005 | .057 |
| 45.0                       | -.007              | -.070 | .185 | .007                | -.007 | .059 | 135.0          | -.016              | .014  | .197 | -.002               | -.008 | .055 |
| 50.0                       | -.009              | -.067 | .182 | .007                | -.004 | .059 | 140.0          | -.016              | .020  | .200 | -.002               | -.009 | .054 |
| 55.0                       | -.009              | -.067 | .180 | .009                | -.004 | .061 | 145.0          | -.015              | .022  | .203 | -.012               | -.004 | .054 |
| 60.0                       | -.010              | -.064 | .175 | .011                | -.002 | .065 | 150.0          | -.014              | .021  | .204 | -.009               | -.010 | .054 |
| 65.0                       | -.010              | -.062 | .178 | .009                | -.002 | .066 | 155.0          | -.012              | .018  | .206 | -.014               | -.009 | .055 |
| 70.0                       | -.010              | -.057 | .178 | .007                | -.002 | .064 | 160.0          | -.011              | .019  | .207 | -.019               | -.006 | .057 |
| 75.0                       | -.010              | -.053 | .173 | .004                | -.003 | .064 | 165.0          | -.010              | .016  | .207 | -.023               | -.002 | .058 |
| 80.0                       | -.010              | -.049 | .180 | .002                | -.004 | .061 | 170.0          | -.008              | .013  | .207 | -.027               | .001  | .060 |
| 85.0                       | -.010              | -.042 | .181 | .000                | -.003 | .061 | 175.0          | -.008              | .014  | .206 | -.030               | .005  | .061 |
| 90.0                       | -.011              | -.039 | .181 | .000                | -.003 | .061 | 180.0          | -.006              | .012  | .205 | -.034               | .008  | .064 |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 100.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL |
| 0              | .005               | .120  | .204                | .077 | 90.0           | -.026              | -.034 | .002                | -.005 | .072                | .072 |
| 5.0            | .002               | .126  | .204                | .077 | 95.0           | -.026              | -.024 | -.001               | -.006 | .071                | .071 |
| 10.0           | -.001              | -.102 | .203                | .077 | 100.0          | -.027              | -.011 | -.004               | -.006 | .071                | .071 |
| 15.0           | -.004              | .120  | .203                | .076 | 105.0          | -.027              | .001  | .006                | -.006 | .070                | .070 |
| 20.0           | -.007              | .117  | .202                | .074 | 110.0          | -.026              | .021  | -.008               | -.006 | .069                | .069 |
| 25.0           | -.010              | .108  | .199                | .073 | 115.0          | -.025              | .034  | -.010               | -.006 | .070                | .070 |
| 30.0           | -.012              | .123  | .198                | .072 | 120.0          | -.026              | -.010 | -.011               | -.005 | .070                | .070 |
| 35.0           | -.015              | .100  | .196                | .072 | 125.0          | -.026              | .060  | -.011               | -.004 | .069                | .069 |
| 40.0           | -.017              | .094  | .193                | .071 | 130.0          | -.028              | .070  | -.008               | -.007 | .065                | .065 |
| 45.0           | -.018              | -.091 | .191                | .074 | 135.0          | -.029              | .077  | -.006               | -.008 | .063                | .063 |
| 50.0           | -.022              | -.086 | .188                | .072 | 140.0          | -.028              | .091  | -.006               | -.008 | .062                | .062 |
| 55.0           | -.024              | -.082 | .178                | .073 | 145.0          | -.026              | .098  | -.012               | -.006 | .062                | .062 |
| 60.0           | -.024              | -.076 | .184                | .075 | 150.0          | -.023              | .101  | -.012               | -.008 | .061                | .061 |
| 65.0           | -.025              | -.068 | .184                | .074 | 155.0          | -.020              | .099  | -.017               | -.007 | .062                | .062 |
| 70.0           | -.025              | -.061 | .172                | .074 | 160.0          | -.017              | .105  | -.022               | -.003 | .063                | .063 |
| 75.0           | -.026              | -.054 | .185                | .072 | 165.0          | -.015              | .103  | -.026               | -.002 | .064                | .064 |
| 80.0           | -.025              | -.041 | .186                | .072 | 170.0          | -.012              | .101  | -.029               | -.007 | .067                | .067 |
| 85.0           | -.025              | -.034 | .187                | .072 | 175.0          | -.011              | .107  | -.032               | -.012 | .067                | .067 |
| 90.0           | -.026              | -.034 | .187                | .072 | 180.0          | -.007              | .106  | -.035               | -.015 | .070                | .070 |

\*\*\*AZIMUTH ANGLE = 105.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|------|
|                | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL |
| 0              | .006               | .140  | .212                | .087 | 90.0           | -.041              | -.030 | .006                | -.008 | .083                | .083 |
| 5.0            | .001               | .150  | .212                | .088 | 95.0           | -.041              | -.015 | -.000               | -.009 | .082                | .082 |
| 10.0           | -.005              | .150  | .211                | .088 | 100.0          | -.041              | .005  | -.006               | -.009 | .081                | .081 |
| 15.0           | -.009              | .146  | .210                | .087 | 105.0          | -.040              | .025  | -.010               | -.009 | .080                | .080 |
| 20.0           | -.014              | .141  | .209                | .086 | 110.0          | -.038              | .055  | -.013               | -.009 | .079                | .079 |
| 25.0           | -.018              | .133  | .206                | .085 | 115.0          | -.036              | .075  | -.015               | -.009 | .078                | .078 |
| 30.0           | -.021              | .155  | .204                | .085 | 120.0          | -.037              | .009  | -.016               | -.009 | .076                | .076 |
| 35.0           | -.025              | .120  | .202                | .085 | 125.0          | -.037              | .115  | -.015               | -.006 | .076                | .076 |
| 40.0           | -.028              | .116  | .199                | .085 | 130.0          | -.041              | .130  | -.013               | -.009 | .073                | .073 |
| 45.0           | -.030              | .112  | .197                | .089 | 135.0          | -.042              | .140  | -.010               | -.008 | .072                | .072 |
| 50.0           | -.033              | .105  | .194                | .085 | 140.0          | -.040              | .162  | -.010               | -.008 | .071                | .071 |
| 55.0           | -.036              | .105  | .192                | .085 | 145.0          | -.037              | .175  | -.012               | -.008 | .070                | .070 |
| 60.0           | -.038              | .100  | .181                | .085 | 150.0          | -.033              | .181  | -.015               | -.007 | .069                | .069 |
| 65.0           | -.039              | -.089 | .190                | .084 | 155.0          | -.028              | .180  | -.020               | -.005 | .070                | .070 |
| 70.0           | -.041              | -.079 | .190                | .084 | 160.0          | -.024              | .191  | -.025               | -.000 | .070                | .070 |
| 75.0           | -.041              | -.069 | .171                | .083 | 165.0          | -.020              | .191  | -.032               | .007  | .071                | .071 |
| 80.0           | -.042              | -.059 | .191                | .083 | 170.0          | -.016              | .190  | -.034               | .013  | .074                | .074 |
| 85.0           | -.041              | -.040 | .192                | .083 | 175.0          | -.015              | .200  | -.037               | .020  | .074                | .074 |
| 90.0           | -.041              | -.030 | .193                | .083 | 180.0          | -.009              | .200  | -.037               | .023  | .076                | .076 |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 110.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  |
|----------------|------------------------------|-------|------|------------------------------|-------|------|----------------|------------------------------|-------|------|------------------------------|-------|------|
| 0              | .006                         | -.165 | .229 | .017                         | .020  | .097 | 90.0           | -.059                        | -.026 | .187 | -.003                        | -.006 | .075 |
| 5.0            | -.002                        | -.172 | .228 | .018                         | .012  | .098 | 95.0           | -.060                        | -.010 | .189 | -.006                        | -.007 | .074 |
| 10.0           | -.011                        | -.171 | .227 | .019                         | .008  | .097 | 100.0          | -.062                        | .017  | .193 | -.010                        | -.007 | .073 |
| 15.0           | -.017                        | -.167 | .226 | .018                         | .003  | .097 | 105.0          | -.062                        | .041  | .198 | -.012                        | -.007 | .072 |
| 20.0           | -.024                        | -.162 | .224 | .017                         | .000  | .095 | 110.0          | -.062                        | .073  | .204 | -.014                        | -.007 | .072 |
| 25.0           | -.029                        | -.155 | .221 | .017                         | .000  | .094 | 115.0          | -.061                        | .102  | .212 | -.017                        | -.007 | .073 |
| 30.0           | -.033                        | -.171 | .218 | .016                         | -.002 | .094 | 120.0          | -.061                        | .073  | .218 | -.019                        | -.006 | .073 |
| 35.0           | -.038                        | -.145 | .214 | .015                         | -.002 | .093 | 125.0          | -.061                        | .162  | .224 | -.020                        | -.003 | .075 |
| 40.0           | -.042                        | -.139 | .210 | .014                         | -.008 | .092 | 130.0          | -.063                        | .190  | .238 | -.020                        | -.004 | .075 |
| 45.0           | -.045                        | -.133 | .206 | .012                         | -.003 | .093 | 135.0          | -.062                        | .211  | .236 | -.019                        | -.002 | .076 |
| 50.0           | -.048                        | -.127 | .201 | .011                         | .000  | .089 | 140.0          | -.059                        | .235  | .240 | -.020                        | -.002 | .075 |
| 55.0           | -.051                        | -.116 | .196 | .009                         | -.003 | .087 | 145.0          | -.055                        | .258  | .244 | -.022                        | -.002 | .073 |
| 60.0           | -.053                        | -.107 | .186 | .008                         | -.003 | .085 | 150.0          | -.049                        | .271  | .247 | -.025                        | -.001 | .072 |
| 65.0           | -.054                        | -.098 | .189 | .005                         | -.004 | .083 | 155.0          | -.042                        | .277  | .247 | -.029                        | .000  | .072 |
| 70.0           | -.056                        | -.087 | .187 | .003                         | -.004 | .079 | 160.0          | -.035                        | .290  | .249 | -.033                        | .004  | .072 |
| 75.0           | -.057                        | -.077 | .172 | .002                         | -.004 | .080 | 165.0          | -.029                        | .294  | .249 | -.036                        | .009  | .072 |
| 80.0           | -.058                        | -.065 | .185 | .001                         | -.004 | .077 | 170.0          | -.022                        | .297  | .247 | -.038                        | .015  | .073 |
| 85.0           | -.058                        | -.046 | .185 | -.002                        | -.005 | .076 | 175.0          | -.018                        | .304  | .245 | -.040                        | .021  | .071 |
| 90.0           | -.059                        | -.026 | .187 | -.003                        | -.006 | .075 | 180.0          | -.011                        | .300  | .242 | -.042                        | .023  | .072 |

\*\*\*AZIMUTH ANGLE = 115.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  | ELEV.<br>ANGLE | FORCE COEFFICIENTS<br>NORMAL | AXIAL | SIDE | MOMENT COEFFICIENTS<br>PITCH | ROLL  | YAW  |
|----------------|------------------------------|-------|------|------------------------------|-------|------|----------------|------------------------------|-------|------|------------------------------|-------|------|
| 0              | .006                         | -.191 | .246 | .010                         | .026  | .107 | 90.0           | -.077                        | -.023 | .181 | -.013                        | -.004 | .068 |
| 5.0            | -.006                        | -.194 | .244 | .011                         | .016  | .108 | 95.0           | -.080                        | -.005 | .184 | -.013                        | -.005 | .066 |
| 10.0           | -.017                        | -.193 | .243 | .010                         | .010  | .107 | 100.0          | -.083                        | .029  | .189 | -.014                        | -.005 | .065 |
| 15.0           | -.026                        | -.189 | .242 | .008                         | .005  | .107 | 105.0          | -.084                        | .057  | .197 | -.014                        | -.005 | .064 |
| 20.0           | -.034                        | -.183 | .239 | .006                         | .002  | .105 | 110.0          | -.086                        | .091  | .205 | -.016                        | -.005 | .065 |
| 25.0           | -.041                        | -.177 | .236 | .005                         | .001  | .103 | 115.0          | -.086                        | .130  | .214 | -.019                        | -.005 | .068 |
| 30.0           | -.046                        | -.188 | .232 | .003                         | .000  | .103 | 120.0          | -.086                        | .137  | .221 | -.022                        | -.003 | .070 |
| 35.0           | -.052                        | -.170 | .226 | .001                         | .000  | .101 | 125.0          | -.085                        | .210  | .227 | -.025                        | .000  | .074 |
| 40.0           | -.056                        | -.162 | .221 | -.001                        | -.006 | .099 | 130.0          | -.085                        | .250  | .237 | -.027                        | .001  | .077 |
| 45.0           | -.060                        | -.154 | .215 | -.004                        | -.001 | .098 | 135.0          | -.082                        | .283  | .239 | -.029                        | .002  | .080 |
| 50.0           | -.063                        | -.150 | .208 | -.007                        | .001  | .093 | 140.0          | -.078                        | .309  | .243 | -.031                        | .003  | .079 |
| 55.0           | -.066                        | -.127 | .201 | -.009                        | .000  | .090 | 145.0          | -.073                        | .341  | .247 | -.032                        | .004  | .077 |
| 60.0           | -.068                        | -.114 | .191 | -.011                        | .000  | .086 | 150.0          | -.065                        | .361  | .251 | -.035                        | .005  | .076 |
| 65.0           | -.070                        | -.109 | .189 | -.013                        | -.001 | .082 | 155.0          | -.056                        | .374  | .250 | -.038                        | .005  | .075 |
| 70.0           | -.072                        | -.096 | .184 | -.014                        | -.002 | .075 | 160.0          | -.047                        | .390  | .253 | -.041                        | .009  | .074 |
| 75.0           | -.073                        | -.086 | .174 | -.014                        | -.002 | .076 | 165.0          | -.038                        | .397  | .253 | -.043                        | .012  | .073 |
| 80.0           | -.074                        | -.072 | .179 | -.013                        | -.003 | .072 | 170.0          | -.029                        | .404  | .251 | -.045                        | .018  | .072 |
| 85.0           | -.075                        | -.053 | .179 | -.014                        | -.003 | .070 | 175.0          | -.022                        | .408  | .249 | -.046                        | .022  | .069 |
| 90.0           | -.077                        | -.023 | .181 | -.013                        | -.004 | .068 | 180.0          | -.014                        | .400  | .246 | -.047                        | .023  | .069 |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 120.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |     |      |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-----|------|
|                | NORMAL             | AXIAL | AXIAL               | SIDE |                | PITCH              | ROLL  | YAW                 | PITCH | ROLL                | YAW |      |
| 0              | .006               | -.217 | .263                |      | 90.0           | -.096              | -.020 | .175                | -.023 | -.003               |     | .061 |
| 5.0            | -.010              | -.217 | .261                |      | 95.0           | -.100              | .000  | .179                | -.020 | -.004               |     | .059 |
| 10.0           | -.023              | -.215 | .259                |      | 100.0          | -.104              | .042  | .186                | -.018 | -.004               |     | .057 |
| 15.0           | -.035              | -.211 | .259                |      | 105.0          | -.107              | .073  | .196                | -.017 | -.003               |     | .057 |
| 20.0           | -.044              | -.204 | .255                |      | 110.0          | -.110              | .110  | .206                | -.018 | -.003               |     | .059 |
| 25.0           | -.053              | -.200 | .251                |      | 115.0          | -.111              | .158  | .216                | -.021 | -.003               |     | .064 |
| 30.0           | -.059              | -.205 | .246                |      | 120.0          | -.111              | .202  | .224                | -.025 | -.001               |     | .068 |
| 35.0           | -.066              | -.195 | .239                |      | 125.0          | -.109              | .258  | .230                | -.031 | .002                |     | .074 |
| 40.0           | -.070              | -.186 | .233                |      | 130.0          | -.107              | .310  | .236                | -.035 | .006                |     | .080 |
| 45.0           | -.075              | -.175 | .224                |      | 135.0          | -.103              | .355  | .242                | -.039 | .008                |     | .084 |
| 50.0           | -.079              | -.173 | .215                |      | 140.0          | -.097              | .383  | .246                | -.042 | .009                |     | .084 |
| 55.0           | -.082              | -.139 | .206                |      | 145.0          | -.091              | .425  | .250                | -.043 | .010                |     | .081 |
| 60.0           | -.084              | -.122 | .197                |      | 150.0          | -.082              | .452  | .255                | -.045 | .011                |     | .080 |
| 65.0           | -.086              | -.119 | .189                |      | 155.0          | -.070              | .472  | .254                | -.047 | .011                |     | .078 |
| 70.0           | -.088              | -.105 | .182                |      | 160.0          | -.059              | .490  | .257                | -.049 | .014                |     | .077 |
| 75.0           | -.089              | -.095 | .176                |      | 165.0          | -.047              | .500  | .258                | -.050 | .015                |     | .074 |
| 80.0           | -.091              | -.079 | .173                |      | 170.0          | -.036              | .512  | .256                | -.052 | .021                |     | .071 |
| 85.0           | -.093              | -.060 | .173                |      | 175.0          | -.026              | .512  | .254                | -.052 | .023                |     | .067 |
| 90.0           | -.096              | -.020 | .175                |      | 180.0          | -.017              | .500  | .250                | -.053 | .024                |     | .066 |

\*\*\*AZIMUTH ANGLE = 125.0\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | AXIAL               | SIDE |                | PITCH              | ROLL  | YAW                 | PITCH |                | ROLL               | YAW   | PITCH               | ROLL  |
| 0              | .000               | -.271 | .257                |      | 90.0           | -.115              | -.026 | -.029               | -.002 |                | -.115              | -.026 | -.029               | -.002 |
| 5.0            | -.015              | -.271 | .255                |      | 95.0           | -.119              | .008  | -.119               | -.003 |                | -.119              | .008  | -.119               | -.003 |
| 10.0           | -.030              | -.267 | .252                |      | 100.0          | -.124              | .063  | -.026               | -.003 |                | -.124              | .063  | -.026               | -.003 |
| 15.0           | -.044              | -.267 | .251                |      | 105.0          | -.128              | .106  | -.025               | -.002 |                | -.128              | .106  | -.025               | -.002 |
| 20.0           | -.055              | -.252 | .247                |      | 110.0          | -.131              | .156  | -.026               | -.002 |                | -.131              | .156  | -.026               | -.002 |
| 25.0           | -.065              | -.249 | .243                |      | 115.0          | -.133              | .212  | -.028               | -.002 |                | -.133              | .212  | -.028               | -.002 |
| 30.0           | -.074              | -.248 | .238                |      | 120.0          | -.133              | .261  | -.029               | -.001 |                | -.133              | .261  | -.029               | -.001 |
| 35.0           | -.083              | -.236 | .232                |      | 125.0          | -.130              | .319  | -.030               | .001  |                | -.130              | .319  | -.030               | .001  |
| 40.0           | -.088              | -.225 | .224                |      | 130.0          | -.127              | .367  | -.028               | .002  |                | -.127              | .367  | -.028               | .002  |
| 45.0           | -.094              | -.213 | .215                |      | 135.0          | -.121              | .414  | -.027               | .002  |                | -.121              | .414  | -.027               | .002  |
| 50.0           | -.098              | -.208 | .206                |      | 140.0          | -.113              | .442  | -.030               | .002  |                | -.113              | .442  | -.030               | .002  |
| 55.0           | -.102              | -.177 | .197                |      | 145.0          | -.105              | .480  | -.033               | .002  |                | -.105              | .480  | -.033               | .002  |
| 60.0           | -.104              | -.161 | .188                |      | 150.0          | -.094              | .512  | -.036               | .002  |                | -.094              | .512  | -.036               | .002  |
| 65.0           | -.106              | -.153 | .181                |      | 155.0          | -.081              | .531  | -.039               | .003  |                | -.081              | .531  | -.039               | .003  |
| 70.0           | -.108              | -.133 | .175                |      | 160.0          | -.067              | .552  | -.040               | .005  |                | -.067              | .552  | -.040               | .005  |
| 75.0           | -.108              | -.116 | .171                |      | 165.0          | -.054              | .560  | -.041               | .006  |                | -.054              | .560  | -.041               | .006  |
| 80.0           | -.110              | -.092 | .169                |      | 170.0          | -.041              | .572  | -.043               | .012  |                | -.041              | .572  | -.043               | .012  |
| 85.0           | -.112              | -.071 | .170                |      | 175.0          | -.029              | .571  | -.043               | .013  |                | -.029              | .571  | -.043               | .013  |
| 90.0           | -.115              | -.026 | .172                |      | 180.0          | -.018              | .566  | -.044               | .015  |                | -.018              | .566  | -.044               | .015  |

Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 130.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | -.004              | -.325 | .251                | -.004 | 90.0           | -.134              | -.033 | -.035               | -.002 | -.035               | -.002 |
| 5.0            | -.021              | -.325 | .249                | -.005 | 95.0           | -.139              | .016  | -.034               | -.002 | -.034               | -.002 |
| 10.0           | -.038              | -.319 | .246                | -.009 | 100.0          | -.144              | .084  | -.034               | -.002 | -.034               | -.002 |
| 15.0           | -.054              | -.323 | .244                | -.013 | 105.0          | -.149              | .139  | -.034               | -.001 | -.034               | -.001 |
| 20.0           | -.067              | -.301 | .239                | -.017 | 110.0          | -.153              | .202  | -.035               | -.001 | -.035               | -.001 |
| 25.0           | -.078              | -.298 | .235                | -.021 | 115.0          | -.156              | .266  | -.035               | -.001 | -.035               | -.001 |
| 30.0           | -.090              | -.291 | .230                | -.026 | 120.0          | -.155              | .320  | -.033               | -.001 | -.033               | -.001 |
| 35.0           | -.100              | -.278 | .225                | -.032 | 125.0          | -.152              | .380  | -.029               | -.001 | -.029               | -.001 |
| 40.0           | -.107              | -.265 | .216                | -.038 | 130.0          | -.147              | .424  | -.021               | -.002 | -.021               | -.002 |
| 45.0           | -.113              | -.251 | .206                | -.042 | 135.0          | -.140              | .473  | -.016               | -.003 | -.016               | -.003 |
| 50.0           | -.118              | -.243 | .197                | -.044 | 140.0          | -.130              | .501  | -.019               | -.005 | -.019               | -.005 |
| 55.0           | -.122              | -.216 | .188                | -.044 | 145.0          | -.119              | .535  | -.024               | -.005 | -.024               | -.005 |
| 60.0           | -.125              | -.200 | .179                | -.042 | 150.0          | -.106              | .573  | -.028               | -.005 | -.028               | -.005 |
| 65.0           | -.126              | -.187 | .173                | -.042 | 155.0          | -.092              | .590  | -.031               | -.005 | -.031               | -.005 |
| 70.0           | -.128              | -.161 | .169                | -.040 | 160.0          | -.076              | .614  | -.031               | -.003 | -.031               | -.003 |
| 75.0           | -.137              | -.137 | .166                | -.037 | 165.0          | -.061              | .621  | -.032               | -.001 | -.032               | -.001 |
| 80.0           | -.129              | -.105 | .166                | -.036 | 170.0          | -.046              | .632  | -.034               | -.003 | -.034               | -.003 |
| 85.0           | -.131              | -.083 | .167                | -.035 | 175.0          | -.032              | .631  | -.034               | -.004 | -.034               | -.004 |
| 90.0           | -.134              | -.033 | .170                | -.035 | 180.0          | -.020              | .633  | -.035               | -.006 | -.035               | -.006 |

\*\*\*AZIMUTH ANGLE = 135.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
|                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | PITCH               | ROLL  | PITCH               | ROLL  |
| 0              | -.010              | -.379 | .245                | -.008 | 90.0           | -.154              | -.040 | -.041               | -.002 | -.041               | -.002 |
| 5.0            | -.027              | -.379 | .243                | -.010 | 95.0           | -.159              | .025  | -.042               | -.002 | -.042               | -.002 |
| 10.0           | -.046              | -.371 | .240                | -.014 | 100.0          | -.165              | .105  | -.043               | -.001 | -.043               | -.001 |
| 15.0           | -.064              | -.380 | .237                | -.019 | 105.0          | -.171              | .173  | -.043               | -.001 | -.043               | -.001 |
| 20.0           | -.079              | -.350 | .231                | -.023 | 110.0          | -.175              | .249  | -.044               | -.001 | -.044               | -.001 |
| 25.0           | -.091              | -.347 | .227                | -.029 | 115.0          | -.178              | .321  | -.042               | -.001 | -.042               | -.001 |
| 30.0           | -.106              | -.335 | .222                | -.035 | 120.0          | -.177              | .380  | -.038               | -.002 | -.038               | -.002 |
| 35.0           | -.117              | -.320 | .218                | -.042 | 125.0          | -.174              | .441  | -.029               | -.001 | -.029               | -.001 |
| 40.0           | -.126              | -.305 | .208                | -.049 | 130.0          | -.168              | .482  | -.014               | -.006 | -.014               | -.006 |
| 45.0           | -.133              | -.290 | .198                | -.053 | 135.0          | -.159              | .533  | -.005               | -.009 | -.005               | -.009 |
| 50.0           | -.138              | -.278 | .188                | -.054 | 140.0          | -.147              | .561  | -.008               | -.012 | -.008               | -.012 |
| 55.0           | -.143              | -.255 | .179                | -.052 | 145.0          | -.134              | .590  | -.015               | -.013 | -.015               | -.013 |
| 60.0           | -.146              | -.240 | .171                | -.049 | 150.0          | -.119              | .634  | -.020               | -.014 | -.020               | -.014 |
| 65.0           | -.147              | -.221 | .166                | -.047 | 155.0          | -.103              | .650  | -.023               | -.013 | -.023               | -.013 |
| 70.0           | -.148              | -.190 | .163                | -.044 | 160.0          | -.085              | .676  | -.023               | -.012 | -.023               | -.012 |
| 75.0           | -.148              | -.159 | .162                | -.041 | 165.0          | -.068              | .682  | -.024               | -.010 | -.024               | -.010 |
| 80.0           | -.149              | -.119 | .163                | -.040 | 170.0          | -.051              | .693  | -.025               | -.006 | -.025               | -.006 |
| 85.0           | -.151              | -.095 | .164                | -.040 | 175.0          | -.036              | .691  | -.026               | -.005 | -.026               | -.005 |
| 90.0           | -.154              | -.040 | .168                | -.041 | 180.0          | -.022              | .700  | -.027               | -.002 | -.027               | -.002 |

Table A-4 cont'd

| ****AZIMUTH ANGLE = 140.0**** |                 |                |                            |                              |                             |                            |                |                 |                |                            |
|-------------------------------|-----------------|----------------|----------------------------|------------------------------|-----------------------------|----------------------------|----------------|-----------------|----------------|----------------------------|
| ELEV.<br>ANGLE                | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE COEFFICIENTS<br>SIDE |
| 0                             | -.010           | -.452          | .232                       | -.008                        | .016                        | .091                       | 90.0           | -.165           | -.027          | .149                       |
| 5.0                           | -.034           | -.450          | .230                       | -.010                        | .008                        | .090                       | 95.0           | -.170           | .029           | .154                       |
| 10.0                          | -.058           | -.442          | .228                       | -.013                        | .004                        | .090                       | 100.0          | -.177           | .104           | .160                       |
| 15.0                          | -.078           | -.443          | .225                       | -.017                        | .000                        | .089                       | 105.0          | -.184           | .177           | .166                       |
| 20.0                          | -.095           | -.416          | .220                       | -.021                        | -.001                       | .088                       | 110.0          | -.188           | .258           | .172                       |
| 25.0                          | -.109           | -.404          | .216                       | -.028                        | -.002                       | .087                       | 115.0          | -.191           | .334           | .179                       |
| 30.0                          | -.123           | -.383          | .210                       | -.036                        | -.002                       | .085                       | 120.0          | -.192           | .400           | .186                       |
| 35.0                          | -.133           | -.358          | .205                       | -.049                        | .000                        | .088                       | 125.0          | -.189           | .465           | .192                       |
| 40.0                          | -.142           | -.330          | .195                       | -.057                        | .000                        | .081                       | 130.0          | -.182           | .513           | .195                       |
| 45.0                          | -.149           | -.305          | .185                       | -.060                        | .000                        | .078                       | 135.0          | -.172           | .562           | .196                       |
| 50.0                          | -.153           | -.281          | .174                       | -.058                        | .000                        | .074                       | 140.0          | -.157           | .595           | .199                       |
| 55.0                          | -.156           | -.252          | .164                       | -.053                        | .001                        | .070                       | 145.0          | -.141           | .626           | .199                       |
| 60.0                          | -.158           | -.233          | .156                       | -.050                        | .001                        | .066                       | 150.0          | -.123           | .667           | .200                       |
| 65.0                          | -.158           | -.214          | .150                       | -.049                        | .001                        | .064                       | 155.0          | -.106           | .685           | .200                       |
| 70.0                          | -.158           | -.188          | .146                       | -.049                        | .000                        | .060                       | 160.0          | -.087           | .707           | .197                       |
| 75.0                          | -.157           | -.161          | .144                       | -.048                        | .000                        | .058                       | 165.0          | -.069           | .714           | .195                       |
| 80.0                          | -.158           | -.124          | .144                       | -.047                        | -.001                       | .057                       | 170.0          | -.051           | .725           | .190                       |
| 85.0                          | -.161           | -.091          | .146                       | -.046                        | -.001                       | .057                       | 175.0          | -.036           | .725           | .183                       |
| 90.0                          | -.165           | -.027          | .149                       | -.046                        | -.002                       | .053                       | 180.0          | -.021           | .733           | .176                       |
| ****AZIMUTH ANGLE = 145.0**** |                 |                |                            |                              |                             |                            |                |                 |                |                            |
| ELEV.<br>ANGLE                | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE COEFFICIENTS<br>SIDE | MOMENT COEFFICIENTS<br>PITCH | MOMENT COEFFICIENTS<br>ROLL | MOMENT COEFFICIENTS<br>YAW | ELEV.<br>ANGLE | FORCE<br>NORMAL | FORCE<br>AXIAL | FORCE COEFFICIENTS<br>SIDE |
| 0                             | -.010           | -.526          | .220                       | -.009                        | .015                        | .085                       | 90.0           | -.176           | -.015          | .131                       |
| 5.0                           | -.041           | -.521          | .218                       | -.010                        | .006                        | .084                       | 95.0           | -.182           | .033           | .135                       |
| 10.0                          | -.070           | -.513          | .216                       | -.012                        | .003                        | .084                       | 100.0          | -.189           | .103           | .141                       |
| 15.0                          | -.092           | -.506          | .213                       | -.015                        | .000                        | .083                       | 105.0          | -.197           | .181           | .147                       |
| 20.0                          | -.112           | -.482          | .209                       | -.019                        | -.002                       | .083                       | 110.0          | -.202           | .267           | .154                       |
| 25.0                          | -.127           | -.462          | .205                       | -.027                        | -.003                       | .082                       | 115.0          | -.205           | .347           | .161                       |
| 30.0                          | -.140           | -.431          | .199                       | -.037                        | -.002                       | .081                       | 120.0          | -.207           | .421           | .168                       |
| 35.0                          | -.149           | -.396          | .193                       | -.056                        | -.001                       | .082                       | 125.0          | -.204           | .489           | .174                       |
| 40.0                          | -.158           | -.356          | .183                       | -.066                        | -.001                       | .077                       | 130.0          | -.197           | .544           | .175                       |
| 45.0                          | -.165           | -.320          | .172                       | -.068                        | -.001                       | .075                       | 135.0          | -.185           | .591           | .176                       |
| 50.0                          | -.168           | -.285          | .160                       | -.062                        | .000                        | .070                       | 140.0          | -.167           | .629           | .177                       |
| 55.0                          | -.169           | -.250          | .150                       | -.054                        | .001                        | .065                       | 145.0          | -.148           | .663           | .176                       |
| 60.0                          | -.170           | -.226          | .141                       | -.051                        | .001                        | .060                       | 150.0          | -.128           | .701           | .176                       |
| 65.0                          | -.169           | -.207          | .134                       | -.051                        | .001                        | .056                       | 155.0          | -.109           | .720           | .174                       |
| 70.0                          | -.168           | -.186          | .130                       | -.054                        | .000                        | .051                       | 160.0          | -.090           | .739           | .170                       |
| 75.0                          | -.166           | -.163          | .127                       | -.055                        | .000                        | .049                       | 165.0          | -.071           | .747           | .166                       |
| 80.0                          | -.167           | -.129          | .126                       | -.054                        | -.001                       | .047                       | 170.0          | -.051           | .757           | .161                       |
| 85.0                          | -.171           | -.088          | .128                       | -.052                        | -.001                       | .046                       | 175.0          | -.036           | .759           | .154                       |
| 90.0                          | -.176           | -.015          | .131                       | -.051                        | -.002                       | .038                       | 180.0          | -.020           | .766           | .147                       |

Table A-4 cont'd

| ****AZIMUTH ANGLE = 150.0**** |                    |       |                     |      |                |                    |       |                     |      |                     |       |
|-------------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
| ELEV.<br>ANGLE                | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|                               | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| .0                            | -.010              | -.600 | .208                | .079 | 90.0           | -.187              | -.003 | .113                | .024 | -.057               | -.002 |
| 5.0                           | -.048              | -.592 | .206                | .078 | 95.0           | -.194              | .038  | .117                | .023 | -.056               | -.002 |
| 10.0                          | -.082              | -.584 | .204                | .078 | 100.0          | -.201              | .102  | .123                | .032 | -.055               | -.003 |
| 15.0                          | -.107              | -.570 | .201                | .078 | 105.0          | -.210              | .185  | .129                | .032 | -.055               | -.003 |
| 20.0                          | -.129              | -.548 | .198                | .078 | 110.0          | -.219              | .276  | .136                | .032 | -.057               | -.002 |
| 25.0                          | -.145              | -.520 | .194                | .078 | 115.0          | -.219              | .360  | .143                | .032 | -.058               | -.001 |
| 30.0                          | -.157              | -.480 | .188                | .077 | 120.0          | -.222              | .442  | .150                | .032 | -.058               | -.000 |
| 35.0                          | -.166              | -.435 | .181                | .076 | 125.0          | -.220              | .514  | .156                | .030 | -.054               | .001  |
| 40.0                          | -.174              | -.382 | .171                | .074 | 130.0          | -.212              | .575  | .156                | .027 | -.044               | -.002 |
| 45.0                          | -.181              | -.335 | .159                | .072 | 135.0          | -.198              | .620  | .156                | .022 | -.034               | -.003 |
| 50.0                          | -.183              | -.289 | .147                | .066 | 140.0          | -.178              | .664  | .156                | .018 | -.027               | -.004 |
| 55.0                          | -.183              | -.248 | .136                | .060 | 145.0          | -.156              | .700  | .152                | .014 | -.023               | -.006 |
| 60.0                          | -.182              | -.219 | .127                | .054 | 150.0          | -.133              | .735  | .152                | .013 | -.021               | -.002 |
| 65.0                          | -.180              | -.200 | .119                | .049 | 155.0          | -.113              | .755  | .148                | .012 | -.021               | .000  |
| 70.0                          | -.178              | -.185 | .114                | .042 | 160.0          | -.093              | .771  | .143                | .013 | -.023               | .001  |
| 75.0                          | -.176              | -.165 | .110                | .040 | 165.0          | -.073              | .780  | .138                | .014 | -.028               | .001  |
| 80.0                          | -.177              | -.135 | .108                | .037 | 170.0          | -.052              | .790  | .132                | .014 | -.035               | .001  |
| 85.0                          | -.182              | -.085 | .110                | .035 | 175.0          | -.037              | .793  | .125                | .015 | -.043               | .000  |
| 90.0                          | -.187              | -.003 | .113                | .024 | 180.0          | -.020              | .800  | .118                | .015 | -.050               | -.001 |

| ****AZIMUTH ANGLE = 155.0**** |                    |       |                     |      |                |                    |       |                     |      |                     |       |
|-------------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
| ELEV.<br>ANGLE                | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|                               | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| .0                            | -.004              | -.646 | .161                | .064 | 90.0           | -.204              | -.002 | .098                | .029 | -.067               | -.002 |
| 5.0                           | -.033              | -.641 | .160                | .064 | 95.0           | -.206              | .057  | .100                | .028 | -.067               | -.002 |
| 10.0                          | -.062              | -.632 | .158                | .064 | 100.0          | -.211              | .125  | .105                | .034 | -.066               | -.002 |
| 15.0                          | -.087              | -.616 | .156                | .064 | 105.0          | -.218              | .218  | .109                | .034 | -.065               | .000  |
| 20.0                          | -.110              | -.591 | .154                | .064 | 110.0          | -.225              | .305  | .114                | .033 | -.065               | .001  |
| 25.0                          | -.129              | -.561 | .131                | .064 | 115.0          | -.228              | .387  | .119                | .033 | -.064               | .002  |
| 30.0                          | -.144              | -.521 | .147                | .064 | 120.0          | -.231              | .466  | .124                | .033 | -.063               | .003  |
| 35.0                          | -.157              | -.473 | .142                | .062 | 125.0          | -.227              | .529  | .128                | .029 | -.058               | .002  |
| 40.0                          | -.169              | -.418 | .135                | .062 | 130.0          | -.218              | .591  | .129                | .025 | -.048               | .000  |
| 45.0                          | -.179              | -.369 | .128                | .060 | 135.0          | -.202              | .637  | .129                | .019 | -.039               | -.001 |
| 50.0                          | -.186              | -.318 | .120                | .056 | 140.0          | -.181              | .682  | .129                | .014 | -.033               | -.004 |
| 55.0                          | -.190              | -.272 | .112                | .052 | 145.0          | -.158              | .718  | .128                | .009 | -.029               | -.007 |
| 60.0                          | -.194              | -.238 | .106                | .048 | 150.0          | -.134              | .750  | .125                | .008 | -.027               | -.005 |
| 65.0                          | -.197              | -.215 | .101                | .045 | 155.0          | -.114              | .770  | .120                | .007 | -.027               | -.003 |
| 70.0                          | -.199              | -.191 | .098                | .040 | 160.0          | -.092              | .784  | .110                | .008 | -.029               | -.001 |
| 75.0                          | -.199              | -.165 | .095                | .039 | 165.0          | -.072              | .794  | .102                | .009 | -.033               | .000  |
| 80.0                          | -.200              | -.130 | .094                | .037 | 170.0          | -.052              | .797  | .095                | .010 | -.039               | .004  |
| 85.0                          | -.202              | -.078 | .096                | .036 | 175.0          | -.036              | .802  | .088                | .011 | -.045               | .004  |
| 90.0                          | -.204              | -.002 | .098                | .029 | 180.0          | -.019              | .807  | .083                | .011 | -.052               | .005  |



Table A-4 cont'd

\*\*\*AZIMUTH ANGLE = 160.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| 0              | .002               | -.693 | .115 | .002                | .005  | .050 | 90.0           | -.222              | -.001 | .083 | -.078               | -.003 | .034 |
| 5.0            | -.019              | -.690 | .114 | -.005               | .002  | .050 | 95.0           | -.219              | .076  | .084 | -.078               | -.002 | .033 |
| 10.0           | -.043              | -.681 | .113 | -.011               | .001  | .050 | 100.0          | -.221              | .148  | .087 | -.075               | -.001 | .036 |
| 15.0           | -.068              | -.662 | .111 | -.018               | .000  | .050 | 105.0          | -.227              | .245  | .089 | -.075               | .001  | .036 |
| 20.0           | -.092              | -.635 | .110 | -.025               | .000  | .050 | 110.0          | -.235              | .334  | .092 | -.073               | .004  | .035 |
| 25.0           | -.113              | -.602 | .068 | -.033               | .000  | .050 | 115.0          | -.238              | .414  | .095 | -.071               | .006  | .034 |
| 30.0           | -.132              | -.563 | .106 | -.043               | -.004 | .051 | 120.0          | -.240              | .490  | .098 | -.068               | .006  | .034 |
| 35.0           | -.149              | -.512 | .103 | -.056               | .000  | .049 | 125.0          | -.234              | .544  | .101 | -.062               | .003  | .028 |
| 40.0           | -.164              | -.454 | .100 | -.065               | -.002 | .050 | 130.0          | -.224              | .608  | .102 | -.053               | .003  | .023 |
| 45.0           | -.177              | -.403 | .097 | -.070               | .002  | .049 | 135.0          | -.206              | .654  | .102 | -.045               | .000  | .016 |
| 50.0           | -.190              | -.347 | .093 | -.070               | .003  | .047 | 140.0          | -.184              | .701  | .102 | -.039               | -.004 | .010 |
| 55.0           | -.198              | -.296 | .089 | -.070               | .003  | .045 | 145.0          | -.160              | .736  | .102 | -.035               | -.009 | .004 |
| 60.0           | -.207              | -.257 | .086 | -.071               | .003  | .042 | 150.0          | -.136              | .765  | .099 | -.033               | -.008 | .003 |
| 65.0           | -.214              | -.230 | .083 | -.074               | .003  | .041 | 155.0          | -.115              | .785  | .092 | -.033               | -.006 | .003 |
| 70.0           | -.220              | -.198 | .082 | -.077               | .001  | .039 | 160.0          | -.091              | .798  | .077 | -.035               | -.004 | .004 |
| 75.0           | -.223              | -.165 | .081 | -.078               | -.001 | .038 | 165.0          | -.071              | .808  | .066 | -.038               | -.001 | .005 |
| 80.0           | -.223              | -.125 | .080 | -.072               | -.002 | .038 | 170.0          | -.052              | .804  | .058 | -.043               | .007  | .006 |
| 85.0           | -.223              | -.071 | .082 | -.078               | -.003 | .037 | 175.0          | -.036              | .811  | .052 | -.048               | .009  | .007 |
| 90.0           | -.222              | -.001 | .083 | -.078               | -.003 | .034 | 180.0          | -.019              | .814  | .048 | -.054               | .011  | .007 |

\*\*\*AZIMUTH ANGLE = 165.0\*\*\*\*

| ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |      | MOMENT COEFFICIENTS |       |      |
|----------------|--------------------|-------|------|---------------------|-------|------|----------------|--------------------|-------|------|---------------------|-------|------|
|                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |                | NORMAL             | AXIAL | SIDE | PITCH               | ROLL  | YAW  |
| 0              | .008               | -.740 | .069 | .008                | .001  | .036 | 90.0           | -.240              | .000  | .068 | -.089               | -.004 | .039 |
| 5.0            | -.005              | -.740 | .068 | -.002               | .001  | .036 | 95.0           | -.232              | .095  | .068 | -.089               | -.002 | .038 |
| 10.0           | -.024              | -.730 | .068 | -.012               | .001  | .037 | 100.0          | -.232              | .171  | .069 | -.088               | .000  | .038 |
| 15.0           | -.049              | -.709 | .067 | -.021               | .001  | .037 | 105.0          | -.236              | .276  | .070 | -.086               | .004  | .038 |
| 20.0           | -.074              | -.679 | .066 | -.029               | .001  | .037 | 110.0          | -.245              | .363  | .071 | -.082               | .008  | .037 |
| 25.0           | -.097              | -.644 | .066 | -.037               | .002  | .037 | 115.0          | -.248              | .442  | .072 | -.078               | .010  | .036 |
| 30.0           | -.120              | -.605 | .066 | -.045               | -.005 | .038 | 120.0          | -.250              | .515  | .073 | -.073               | .010  | .035 |
| 35.0           | -.141              | -.551 | .065 | -.053               | .003  | .036 | 125.0          | -.241              | .560  | .074 | -.066               | .004  | .028 |
| 40.0           | -.160              | -.490 | .065 | -.060               | -.002 | .038 | 130.0          | -.230              | .625  | .075 | -.058               | .006  | .021 |
| 45.0           | -.176              | -.438 | .066 | -.067               | .004  | .038 | 135.0          | -.210              | .672  | .076 | -.051               | .002  | .013 |
| 50.0           | -.194              | -.376 | .066 | -.072               | .004  | .038 | 140.0          | -.188              | .720  | .076 | -.046               | -.005 | .006 |
| 55.0           | -.206              | -.320 | .066 | -.077               | .004  | .038 | 145.0          | -.163              | .755  | .076 | -.042               | -.011 | .000 |
| 60.0           | -.220              | -.276 | .066 | -.081               | .004  | .037 | 150.0          | -.138              | .780  | .073 | -.040               | -.012 | .001 |
| 65.0           | -.232              | -.246 | .066 | -.084               | .004  | .037 | 155.0          | -.116              | .800  | .065 | -.040               | -.010 | .001 |
| 70.0           | -.242              | -.205 | .067 | -.086               | .002  | .038 | 160.0          | -.090              | .812  | .045 | -.041               | -.007 | .000 |
| 75.0           | -.247              | -.165 | .067 | -.087               | -.001 | .038 | 165.0          | -.070              | .823  | .030 | -.044               | -.002 | .001 |
| 80.0           | -.247              | -.120 | .067 | -.078               | -.003 | .039 | 170.0          | -.052              | .811  | .022 | -.047               | .010  | .002 |
| 85.0           | -.244              | -.065 | .068 | -.088               | -.004 | .039 | 175.0          | -.036              | .821  | .016 | -.051               | .014  | .003 |
| 90.0           | -.240              | .000  | .068 | -.089               | -.004 | .039 | 180.0          | -.019              | .821  | .013 | -.057               | .017  | .003 |

Table A-4 cont'd

| ***AZIMUTH ANGLE = 170.0*** |                    |       |                     |      |                |                    |       |                     |       |                     |       |
|-----------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|-------|---------------------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | MOMENT COEFFICIENTS |       |
|                             | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW   | PITCH               | ROLL  |
| 0                           | .003               | -.756 | .045                | .024 | 90.0           | -.229              | .000  | .044                | .025  | -.086               | -.002 |
| 5.0                         | -.021              | -.755 | .045                | .025 | 95.0           | -.228              | .080  | .044                | .025  | -.086               | -.001 |
| 10.0                        | -.047              | -.745 | .045                | .026 | 100.0          | -.231              | .155  | .045                | .025  | -.086               | .000  |
| 15.0                        | -.075              | -.724 | .044                | .026 | 105.0          | -.237              | .250  | .046                | .025  | -.084               | .003  |
| 20.0                        | -.102              | -.696 | .043                | .026 | 110.0          | -.249              | .365  | .047                | .025  | -.081               | .005  |
| 25.0                        | -.125              | -.660 | .003                | .026 | 115.0          | -.252              | .451  | .048                | .024  | -.077               | .007  |
| 30.0                        | -.147              | -.619 | .044                | .026 | 120.0          | -.252              | .516  | .049                | .023  | -.071               | .007  |
| 35.0                        | -.167              | -.560 | .043                | .024 | 125.0          | -.244              | .560  | .050                | .019  | -.062               | .003  |
| 40.0                        | -.183              | -.496 | .043                | .024 | 130.0          | -.227              | .613  | .051                | .014  | -.052               | .005  |
| 45.0                        | -.196              | -.438 | .044                | .024 | 135.0          | -.206              | .658  | .052                | .008  | -.044               | .002  |
| 50.0                        | -.204              | -.379 | .044                | .025 | 140.0          | -.183              | .708  | .052                | .003  | -.041               | -.002 |
| 55.0                        | -.214              | -.326 | .044                | .027 | 145.0          | -.159              | .746  | .051                | .000  | -.039               | -.006 |
| 60.0                        | -.221              | -.281 | .043                | .027 | 150.0          | -.135              | .781  | .049                | -.001 | -.039               | -.007 |
| 65.0                        | -.227              | -.248 | .043                | .026 | 155.0          | -.112              | .804  | .043                | -.001 | -.039               | -.006 |
| 70.0                        | -.229              | -.208 | .044                | .024 | 160.0          | -.086              | .818  | .029                | .000  | -.039               | -.004 |
| 75.0                        | -.230              | -.167 | .044                | .024 | 165.0          | -.066              | .828  | .019                | .000  | -.040               | -.002 |
| 80.0                        | -.230              | -.125 | .044                | .025 | 170.0          | -.047              | .824  | .014                | .000  | -.042               | .005  |
| 85.0                        | -.230              | -.069 | .044                | .025 | 175.0          | -.031              | .830  | .010                | .001  | -.043               | .008  |
| 90.0                        | -.229              | .000  | .044                | .025 | 180.0          | -.015              | .831  | .008                | .001  | -.046               | .010  |

| ***AZIMUTH ANGLE = 175.0*** |                    |       |                     |      |                |                    |       |                     |      |                     |       |
|-----------------------------|--------------------|-------|---------------------|------|----------------|--------------------|-------|---------------------|------|---------------------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |      | MOMENT COEFFICIENTS |       |
|                             | NORMAL             | AXIAL | SIDE                | YAW  |                | NORMAL             | AXIAL | SIDE                | YAW  | PITCH               | ROLL  |
| 0                           | -.001              | -.772 | .022                | .012 | 90.0           | -.218              | -.001 | .021                | .012 | -.083               | -.001 |
| 5.0                         | -.037              | -.770 | .022                | .014 | 95.0           | -.224              | .065  | .021                | .012 | -.083               | .000  |
| 10.0                        | -.070              | -.761 | .022                | .015 | 100.0          | -.230              | .140  | .021                | .012 | -.084               | .000  |
| 15.0                        | -.101              | -.740 | .021                | .015 | 105.0          | -.238              | .225  | .022                | .013 | -.082               | .002  |
| 20.0                        | -.130              | -.714 | .021                | .015 | 110.0          | -.253              | .368  | .023                | .013 | -.080               | .003  |
| 25.0                        | -.154              | -.676 | .001                | .015 | 115.0          | -.256              | .461  | .025                | .012 | -.076               | .004  |
| 30.0                        | -.174              | -.633 | .022                | .015 | 120.0          | -.254              | .518  | .026                | .012 | -.069               | .004  |
| 35.0                        | -.193              | -.569 | .021                | .012 | 125.0          | -.247              | .560  | .027                | .010 | -.058               | .002  |
| 40.0                        | -.206              | -.503 | .022                | .010 | 130.0          | -.224              | .601  | .027                | .007 | -.046               | .004  |
| 45.0                        | -.216              | -.439 | .022                | .010 | 135.0          | -.202              | .644  | .028                | .003 | -.038               | .002  |
| 50.0                        | -.214              | -.382 | .022                | .013 | 140.0          | -.179              | .697  | .028                | .001 | -.036               | .000  |
| 55.0                        | -.223              | -.333 | .022                | .017 | 145.0          | -.156              | .738  | .026                | .001 | -.037               | -.002 |
| 60.0                        | -.222              | -.286 | .021                | .017 | 150.0          | -.133              | .783  | .025                | .001 | -.038               | -.003 |
| 65.0                        | -.222              | -.250 | .021                | .015 | 155.0          | -.108              | .808  | .021                | .001 | -.038               | -.003 |
| 70.0                        | -.216              | -.211 | .021                | .010 | 160.0          | -.083              | .824  | .014                | .001 | -.038               | -.001 |
| 75.0                        | -.213              | -.169 | .021                | .010 | 165.0          | -.062              | .834  | .009                | .001 | -.037               | -.002 |
| 80.0                        | -.213              | -.130 | .021                | .011 | 170.0          | -.043              | .838  | .006                | .000 | -.037               | .001  |
| 85.0                        | -.216              | -.073 | .021                | .011 | 175.0          | -.026              | .840  | .004                | .000 | -.035               | .002  |
| 90.0                        | -.218              | -.001 | .021                | .012 | 180.0          | -.011              | .841  | .003                | .000 | -.035               | .003  |

Table A-4 cont'd

| ***AZIMUTH ANGLE = 180.0*** |                    |       |                     |       |                |                    |       |                     |       |                |                    |       |
|-----------------------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|---------------------|-------|----------------|--------------------|-------|
| ELEV.<br>ANGLE              | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       | MOMENT COEFFICIENTS |       | ELEV.<br>ANGLE | FORCE COEFFICIENTS |       |
|                             | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL | SIDE                | PITCH |                | NORMAL             | AXIAL |
| 0                           | -.006              | -.789 | -.001               | -.052 | .001           | -.208              | -.002 | -.002               | -.080 | .001           | -.208              | -.002 |
| 5.0                         | -.054              | -.786 | -.001               | -.046 | .003           | -.220              | .050  | -.002               | -.081 | .000           | -.220              | .050  |
| 10.0                        | -.094              | -.777 | -.001               | -.036 | .005           | -.229              | .125  | -.002               | -.082 | .000           | -.229              | .125  |
| 15.0                        | -.128              | -.756 | -.001               | -.026 | .004           | -.239              | .200  | -.001               | -.081 | .001           | -.239              | .200  |
| 20.0                        | -.158              | -.732 | -.001               | -.010 | .005           | -.258              | .371  | .000                | -.079 | .001           | -.258              | .371  |
| 25.0                        | -.183              | -.692 | -.001               | -.013 | .005           | -.260              | .471  | .002                | -.076 | .001           | -.260              | .471  |
| 30.0                        | -.202              | -.648 | .000                | -.044 | .004           | -.257              | .520  | .003                | -.067 | .001           | -.257              | .520  |
| 35.0                        | -.219              | -.579 | .000                | -.072 | .001           | -.250              | .560  | .004                | -.054 | .001           | -.250              | .560  |
| 40.0                        | -.230              | -.510 | .001                | -.083 | .004           | -.222              | .590  | .004                | -.040 | .000           | -.222              | .590  |
| 45.0                        | -.236              | -.440 | .001                | -.091 | .003           | -.198              | .631  | .004                | -.032 | .003           | -.198              | .631  |
| 50.0                        | -.224              | -.385 | .000                | -.095 | .000           | -.175              | .686  | .004                | -.032 | .003           | -.175              | .686  |
| 55.0                        | -.232              | -.340 | .000                | -.095 | .002           | -.153              | .730  | .002                | -.035 | .002           | -.153              | .730  |
| 60.0                        | -.224              | -.292 | .001                | -.092 | .002           | -.131              | .785  | .001                | -.038 | .001           | -.131              | .785  |
| 65.0                        | -.217              | -.252 | .001                | -.088 | .001           | -.105              | .812  | .000                | -.037 | .000           | -.105              | .812  |
| 70.0                        | -.203              | -.215 | .001                | -.084 | .000           | -.080              | .830  | .001                | -.037 | .001           | -.080              | .830  |
| 75.0                        | -.197              | -.172 | .002                | -.080 | .001           | -.059              | .840  | .001                | -.034 | .002           | -.059              | .840  |
| 80.0                        | -.197              | -.135 | .002                | -.079 | .001           | -.039              | .852  | .001                | -.032 | .002           | -.039              | .852  |
| 85.0                        | -.202              | -.078 | .002                | -.079 | .001           | -.021              | .850  | .002                | -.028 | .003           | -.021              | .850  |
| 90.0                        | -.208              | -.002 | .002                | -.080 | .000           | -.007              | .852  | .002                | -.024 | .003           | -.007              | .852  |

|  |  |  |           |
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